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JAIN PHILOSOPHY AND MODERN SCIENCE

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MUNI SHRI NAGRAJ JI

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JAIN PHILOSOPHY

And

MODERN SCIENCE

By

Muni Shri Nagraj Ji

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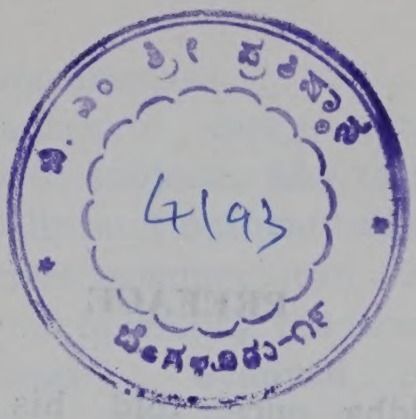

Dedicated

to

Most reverred

ACHARYA SHRI TULSI,

My Guru, Philosopher and Guide.

PREFACE

Lord Buddha once told his disciples, "Oh Bhikshus! You should not consider my preachings as Gospel Truth, because to do so is traditional or they are popular or because they sound beautiful, or because they strengthen your faith or because I am reverred or take the truth for granted, but only when your heart and your reasoning logically accept them as truth." I would like to repeat the above in connection with my book "Jain Philosophy and Modern Science" in order that the reader may not turn a cold shoulder to it just because the writer is neither a Doctor of Philosophy nor of Science. He should evaluate the subject matter on the basis of his impartial judgement.

Having been enunciated in the Jain tradition, Philosophy has naturally been my special subject of study but somehow I am very much attracted and interested in studying the ever new pronouncements of Modern Science also. I have thus been devoted to their study for the last fifteen years. Partly due to the circumstances and partly due to the valued inspiration from the most reverred Acharya Shri Tulsi, I have adopted the comparative study of Philosophy and

Science as my life mission.

One who desires to carry out a comparative study of these two subjects, has to study each one more systematically and authentically than one who wants to be a mere commentator. The amount of effort, put in by me in writing the seven essays, "Philosophy and Science", "Syadvad and Relativity", "Theory of Atom," "Essence of Soul", "Rotation of Earth", Ether and "Dharma and Ether" could seldom be exceeded by the effort required by one to write seven different thesis separately on each subject. My aim was to make a complete and elaborate study of each subject before writing anything about it. In view of the human limitations, I can hardly take any pride on the extent of success in attaining my goal.

I cannot, but take this opportunity to express my gratitude to those English and Hindi authors whose books have been useful to me in my work. In particular I obtained great support from Prof. C. L. Jain, M.Sc. Just when I had completed most of the chapters of my book, I came across his book, "Cosomology Old and New" accidently. I was delighted to find that some body else had also chosen the same subjects for commenting and in the same order as I. I derived great inspiration from this book in my work and found many novel and new angles of vision.

And how can I forget the kind indulgence of those scientists who have always made it a point to consider my studies and likings as their own duty and

have spent a great deal of their valuable time to strengthen my grasp of scientific facts and phenomena. Amongst them are Swami Vidyanand Prof. Vibhuti Bhusan Dutta, M.Sc., former professor, Calcutta University, Sardar Niranjan Singh, M.Sc., the then Principal, Punjab University Camp College, Dr. Radha Vinod, the real savant of international repute, Shri Jetha Lal Jhaveri, B.Sc., a learned student of Science and Jain Philosophy, etc.

Muni Mahendra Kumarji has been right hand in causing this book to be written. The fact is that not only did he produce the whole manuscript but also assisted me greatly in my intellectual labour. To shake me up from a sort of torpor from time to time was his avowed mission. At such times I was practically smothered by his anxiety to make progress in finishing the book. But if this did not happen, the book could have been delayed much longer.

S. 2013, Falgun Sudi 10, **Muni Nagraj.**
Pilani (Rajasthan).

PUBLISHER'S NOTE

The author of the book, Muni Shri Nagraj Ji is one of the distinguished disciples of Acharya Shri Tulsi (who is the head of Terapanth Sect of Jain religion besides being the Sponsor of Anuvrat Movement). Muni Shri is considered to be the chief exponent of Anuvrat Movement. His grasp and understanding of the ills and evils of our Society is clear and objective, and his approach to their solution constructive. This has given Anuvrat movement a dynamic direction. Muni Shri has dedicated his entire life to this movement. He is serving the cause of the emanicipation of the millions of the neglected and downtrodden people from exploitation and other forms of miseries through Anuvratas. He is one of the foremost thinkers and Social reformers of our times. He is a man of action and Philosopher at the same time. Muni Shri Nagraj Ji is a erudite scholar of Philosophy and Theoritical Science, although he has no academic distinctions t ohis credit. Comparative study of Philosophy and Science has become the mission of his life.

'Jain Philosophy and Modern Science' heralds the happy marriage of Philosophy and Science and ushers in a new era in their relationship. In these days of

academic rivalries between Philosophers and Scientists, this approach of the author may look rather strange and odd, specially to Western thinkers, who have kept these two fundamental branches of human knowledge at poles apart by their over emphasis on specialization of knowledge. This created a wide gulf between them and completely divorced them from each other. The author has ingenuously bridged this gulf and thereby fulfilled the urgent need of our age. The approach is singnularly Indian in the sense that, the author has sought to establish a unity in diversity. This could have been possible only at the hands of a Saint Philosopher like the author, who could rightly interpret and translate the spirit of our ancient culture.

The style is simple yet forceful. The manner and method of this rather difficult and intricate theme has been so wisely handled by the author that, it has made the reading interesting and understanding easy.

The book was originally written in Hindi. The present book in your hands, is the English translation of the same. Four chapters have been translated by Muni Shri Mahendra Kumar Ji. Rest of the chapters were translated jointly by Shri Prabhakar Machive, Joint Secretary, Sahitya Academy, Km. Ila Jhaveri, M.A. Shri Rashim Kumar Jhaveri, B.Com., and Shri Virendra Ardhiya, etc. I am indebted to them for their help.

I am also indebted to Shri Mahabir Prasad Jain, Secretary, Anuvrat Prachar Samiti, Lucknow, who has taken personal interest in supervising the publication of the book.

My grateful thanks are also due to Shri Girish Chandra Srivastava for the help he has rendered in the publication of the book.

My gratitude is also due to Shri Jawahar Lal M.A., who has kindly perused the portion specially concerning Marxism and offered valuable suggestions.

My thanks are also due to Shri Satish Chandra Dwivedi for the design of the title cover which he has kindly prepared.

MOTI LAL JAIN,
Secretary,
Anuvrat Samiti,
KANPUR.

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CHAPTER 1

PHILOSOPHY AND SCIENCE

Writing the foreword to his book entitled Physics and Philosophy, Sir James Jeans, the noted scientist, observed: "The border land territory between physics and philosophy which used to seem so dull suddenly becomes so interesting and important through recent developments of theoretical physics."

The era of calling philosophy and science as two different things is now over. Today philosophy provides an answer to the potent question—"KIM TATWAM"—What is reality? At the same time science also tries to find the truth and what is proper.

Philosophy analyses the extensiveness of life. To realise one's self and then to march forward towards one's destination is the real achievement of philosophy. It is because of this, that scientists feel that the object of life lies in finding the causes of grief and in craving for happiness. That thought and action are two different things, is a fac tadmitted by all. To realise the basic principles of life is the possession of philosophical knowledge. Man can follow religion only after

realising the basic principles of life and combining thereot a knowledge of the universe and the soul; and practicing methods which lead the soul towards the attainment of its ultimate aim—MOKSHA—or emancipation of soul. So it is said that "Knowledge and its active utilisation lead to MOKSHA—GYAN KRIYABHYAM MOKSHA.

When we discuss the aim of science and its terminology we find that it insists on only knowing the truth. One should intensively look into the mysteries of the world and arrive at the truth; but in science our scope of activity is restricted only to that extent.

The Birth of Philosophy

Philosophy is properly understood by very few people. In the opinion of many people the different religions practiced by them are the embodiments of different philosophies. They are, therefore, under the impression that philosophy owes its source to the individuals rather than the element of reason. The real position, however, is entirely different. Before the dawn of philosophical era there existed an era of faith. The preachings of Mahavira, Buddha and Kapil etc. were accepted as true because they were preached by those particular individuals. The followers of these individuals took their preachings as gospel truth. In the wake of the era of faith came the era of logic; and it confronted man with the question: "Why should I believe this? Is it because a certain person has said so?" and he felt that truth

must be measured by the scale of logic and reason behind a particular thing. It is at this stage the philosophy came into existence. It is, therefore, wrong to believe that philosophy owes its source to superstitions and not to reason and logic. When people accepted the theories of those in whom they had implicit trust and started proving such theories with logic and reason, philosophy started becoming weaker. This led to the emergence of different philosophies like Jainism, Buddhism, Sankhya, Naiyayika and Vaisheshika philosophies. As a matter of fact all philosophies owe their origin to reason and logic. But behind that reasoning there exists a faith towards the ideals worshipped by that individual. If reason and logic were the only factors vidual. If reason and logic were the only factors behind different philosophies then the ultimate end of every philosophy would have been an entire similarity, like mathematics where two and two always make four. There, however, is one thing that cannot be denied and that is that philosophy has pondered over every subject right from the atom to the universe and that philosophy has stood the test of different schools of logic. The conclusions arrived at through philosophy were not only the figments of imaginations worked out by idle minds.

History of Science

The history of science is entirely different to the history of philosophy. Science has never believed in the honesty of any super human being. It seems

that being tired of the controversial conclusions of philosophy the flow of science started in an independent channel. Scientists have always believed in massive experiments and researches to explain a particular truth and to preserve its uniqueness. According to scientific terminology, truth is only that, which is established inside laboratories and observatories. But to achieve the truth has never been so easy as the scientists have thought it to be. If we read the history of science we find on every page the changing nature of scientific conclusions and discoveries. Ancient scientists like Newton evolved the theories about ether etc., but later experiments led to many different conclusions, so much so that today Professor Albert Einstein has completely overshadowed their existence. In the field of atoms right from the days of Democritus to the days of the existence of Atom bombs and Hydrogen bombs there lies a long link of researches and experiments. The history of atom is not a history of gradual developments. It is rather a history of long researches. But conceding for the time being that it was a history of gradual developments the question naturally arises that if the truth established yesterday can be replaced by another truth established today, what certainty is there that the truth established today will not be replaced by another truth which may be discovered tomorrow. The theories of Ptolemy about the sun, the moon, the earth and the planets were no actcepted in the days of Copernikus and

the theories developed in this respect by Kopernikus have been replaced by Professor Einstein's "Theory of Relativity." Hence, how can we conclude that the theory of Einstein is going to stand good for all times to come.

Newton discovered the Law of Gravitation. In those days the theory that the earth is round and that it is rotating round the sun, was in its infancy. This theory had given rise to many problems viz. "If the earth is round how can oceans like the Indian Ocean remain static; why does their water not flow out to the sky? How is the earth moving in its orbit so punctually? Why is the moon rotating round the earth and why are the other planets and satellites moving round the sun? How and why is their motion uniform?" Pondering over all these difficult questions Newton, the great thinker, was one day sitting in his garden. He saw an apple falling from the tree and coming down to the earth. Incidentally he started thinking: "Why should this fruit necessarily come down to the earth? Why did it not go up?" And by so thinking Newton came to the conclusion that the earth possesses force of attraction. He further developed this idea and it ultimately came to be known as Newton's Law of Gravitation. After this incident and his final discovery of the Law of Gravitation, Newton found that the Law of Gravitation was applicable not only to every atom of this earth but also to the other planets and satellites. With the help of this law, Newton solved all the pro-

blems relating to the motion of the earth and other planets—problems which had remained unsolved till the Law of Gravitation was discovered by Newton. The Law of Gravitation was not merely a hypothesis but a theory proved by mathematical calculations.

In short, the Law of Gravitation can be enunciated as under: "Every material substance attracts every other material substance of the universe with a certain force which is directly proportional to the masses of the two substances and inversaly proportional to the square of the distance between the two." The law can be illustrated by the following numerical example. 'If say, the product of the masses of two substances is 4 units and that of other two substances, separated by the same distance is 20 units, then the force of attraction between the later two will be 20|4 which is equal to 5 times that between the former two. In the same way, 'suppose that the distance between two substances is 30 feet and the distance between the other two substances, the product of the masses of which is equal to that of the masses of the former two substances, is say 120 feet. In other words the product of the masses in the two cases being the same, the distance apart in the second case is 4 times the distance apart in the first case. Hence the force of attraction between the two substances in the second case will be 1|16 times the force of attraction between the two substances in the first case.

From the days of Newton till today, the Law of

Gravitation has solved many problems of Geography and Astronomy. But in the era of Relativity, the Law of Gravitation has been completely overshadowed. According to Einstein there is nothing like the so-called Gravity in this world. The events which appear to us to be caused by the attractive gravitational force are in fact the attributes of the space generated by the motion of the moving objects. In the era of Relativity, the Law of Gravitation is explained as follows:

"We put a pillow in a concave room; and sitting in the room we throw balls on all four sides of the room. Now, because the room is concave all the four balls will dash against the pillow. If we think that the balls were attracted by the pillow and that they dashed against it due to its gravity, we shall be wrong." In this way it is clear that the Law of Gravitation which till yesterday was considered a gospel truth is an out of date proposition today. The 'facts" discovered by science are never absolute and they are replaced by later researches and discoveries. The difficulty is that facts so far undiscovered are hastily refused recognition of, by the scientists. This in turn is due to their ego about the possession of scientific knowledge. Why should they refuse recognition to something which they have neither studied nor about which they have carried out any researches? The knowledge of man is finite. He should never forget that his knowledge is like a drop of water in an ocean. Whatever is not

proved by science is rejected as blind faith and superstition. But science is not contented with its present knowledge about things. At times it so happens that the scientists who take pleasure in exposing the blind faith of the people are themselves exposed by their own dogmatism. The example of meteors is a glaring one in this context. The following quotation on page 705 of the book "Soura Pariwar" (Round the Solar System) under the Chapter "Blind faith of the Scientists", will illustrate the point—"It is not true that only the people have blind faith. Sometimes scientists believe in blind faith while the people are on the right path. In the medieval ages in Europe, as science progressed day by day, the scientists began to believe very srongly that meteors could not fall from the sky. They further believed that meteors have never fallen from the sky before. Those who said that they have seen meteros falling from the sky were labelled as people with blind faith. Those who wrote that they had personally witnessed such incidents were laughed at."

Olivier in his book 'Meteors' writes "Now we are coming to the second half of the 18th Century. In the previous century meteors had fallen many a times. Those who had seen them had written their descriptions. Even though concrete proofs were given, many leading scientists branded them as acts of foolishness and partiality. These scientists were no doubt considering themselves as leaders and most modern and other people also cnsidered them as such. Everyone

who thinks that he can come to a conclusion about things which are beyond his experience must take a lesson from this."

The French Academy of Science appointed a commission to go into the truth about the falling of meteors in Lusse. Though many eye-witnesses deposed to the commission that they had seen the meteors fall, none of them was relied upon. It was stated by the commission that the meteors (stones) had not fallen from the sky but that they were stones from the earth itself and that they had been struck by lightning. Something, worse than even this, had yet to follow. On 24th July in the year 1890 meteors fell in South-west France. At this time a large number of meteors had fallen and they had all penetrated into the surface of the earth. Many other things like lights etc. had been witnessed by hundreds of people. More than three hundred eye-witness accounts were produced—most of them having been stated on oath—along with the pieces of meteoric stones. The scientific journals published these reports but only with the object of laughing at the foolishness and the superstition of the people. It is interesting to quote Birthland here, who, it is said, represented the unprejudiced opinion of many scientists. He observes: "What comments should we give on the report of the commission? The story is basically false; it is physically impossible and it cannot be believed because it is given by eye-witnesses. However, we leave it to the judgement of the intelligent readers

to judge it by reading these accounts."

But meteors were not to be governed by the conclusions of the scientists. They fell again and started falling here and there. There was a full shower of meteors in a village in France in the year 1803.

At this stage the previous beliefs and findings of the French Academy of Science were shaken. It appointed Biot, the famous Scientist, to enquire into the matter. Biot arrived at the conclusion that it was a fact that the meteors had fallen and also that they had fallen from the sky. Since then our knowledge about the fall of meteors has been gradually developing.

Sometimes meteors had fallen in huge numbers simultaneously. In France in the year 1803, three thousand meteors fell together at the same place. The inhabitants of that place were very much perplexed. At another time one lakh meteors fell together in Pultusk—a city in Poland. Hungary had also experienced such a fall of meteors. Very recently, on the 19th July, 1912, about fourteen thousand meteors fell together in Arizona. Sometimes meteors get broken up into different pieces while crossing the layers of atmosphere but generally they are so broken up before they enter the layers of atmosphere. This fact is confirmed by the size of the broken pieces. Pieces which are broken up while nearing the surface of earth are more pointed in shape. Some meteors appear to be as big as the moon,

On entering the layers of atmosphere they burn up along with the other pieces with the result that we see a very big meteor. The terrific sound heard at the time of the falling of meteors is not the sound produced by the meteors themselves. That terrific noise is produced by the friction caused by the high speed of the meteors crossing the layers of the atmosphere and the resultant heat produced by such friction; and this fact is evident from the shortness of time taken by the meteors to reach the earth.

Thus the fall of meteors which was once considered to be a superstition and impossible phenomena by science is today an established scientific fact on the back of which there is a long history of events and researches about the fall of meteors.

There are many more examples to show the changing nature of scientific beliefs and theories. All these lead one to the conclusion that the ego of science and the scientists who considered philosophy to be an ideology of the weaker mind was intercepted by the process of nature; so much so that it has been shattered by now and science and the scientists are themselves in doubt about the correctness of their discoveries and conclusions. While probing into the mysteries of nature day after day, science has realised the shortcomings of its own attainments. In the scientific world the following observations are very commonly heard nowadays:

"We are beginning to appreciate better and

more thoroughly how great is the range of our ignorance."[1]

"Science should leave off making pronouncements: the river of knowledge has too often turned back on itself."[2]

"The oustanding achievements of twentieth century physics is not the Theory of Relativity with its welding together of space and time, or the Theory of Quanta with its present apparent negation of the laws of causation, or the dissection of the atom with the resultant discovery that things are not what they seem; it is the general recognition that we are not yet in contact with ultimate reality."[3]

In this way we naturally arrive at the conclusion that science attempted to flow in an independent channel even at the cost of becoming rebellious against philosophic tenets. The pity is that the path adopted by science was not the right one, as it was considered to be. The fact, however, remains that between science and philosophy there are more things in common and there is lesser of clash. Just as there is a long tradition of knowledge behind philosophy similarly there is a zeal for truth in science. Scientists never sat satisfied on what they deemed to be false. Whereas philosophy created different schools of thoughts like the Vedic Philosophy, Bud-

1. Leopold Infeld.
2. Sir James Jeans in "The Mysterious Universe", p. 138.
3. *Ibid,* p. 111.

dhist Philosophy, Jain Philosophy etc., in the field of science, fortunately there do not exist such different schools of thought. All scientists follow the same path sooner or later.

Philosophy and science have got their own individual importance from the point of view of usefulness. Both of them are a means to arrive at the truth but the means of philosophy are mainly based on spiritual knowledge. Philosophy has gifted humanity with self-introspection, eternal emancipation, firmness of mind, forgiveness, satisfaction, non-violence and truth. Science made developments in the field of materialism and man attained material strength through science. Man can live with joy in the absence of material achievements, but without spiritual and moral developments and strength, there is no way out for him excepting the way that he himself might perish under a heap of huge material achievements.

CHAPTER 2

SYADWAD AND THEORY OF RELATIVITY

Syadwad (the Jain Theory of Non-Absolutism) is a connecting link between the various Schools of Indian Philosophy and is the Nucleus of Jain Philosophy. Its seeds are found scattered in the Jain Agamas propounded thousands of years ago in various forms such as "Utpad Vyaya Dhoruvyam" (the triple doctrine of the origin, the destruction and the permanence), "Syadasti Syannasti" (relative existence and non-existence) universality and particularity, the Theory of Seven Nayas, etc. Sidhasen, Samantabhadra and other Jain thinkers gave a systematic interpretation of the Theory in the form of Doctrine of Seven Predications. After these earlier expressions, many scholars and teachers have written vast literature on this subject which proves its greatness even now. For the last 1500 years Syadwad has been a living phenomenon of the philosophical world and even now it continues to be so.

Relativity is supposed to be a great contribution of the 20th Century to the scientific world. Its propounder was the renowned scientist Prof. Albert

Einstein, who is considered unanimously as one of the greatest intellectuals of the world. In 1905, Einstein wrote an article entitled "Special Theory of Relativity" which was published in the German Year Book of Physics. This article created a stir in the scientific world. After 1916, he enlarged his theory which came to be called "General Theory of Relativity." In 1921, he was awarded the 'Nobel Prize for Physics' for his great contribution. In fact, Einsten's Relativity was like a tidal wave in the calm waters of science. It hit some of the very fundamental dogmas of science and established a new norm. As soon as Relativity came into vogue, the Law of Gravitation which was all in all from the days of Newton, was de-throned. Existence of Ether could be saved only by an hair-breadth escape and the concepts of Space and Time took a new form. It met with a lot of opposition in the beginning; but ultimately, because of its mathematical soundness, the Theory of Relativity got universal acceptance as a new contribution to science. Thus, this chapter proposes to put before readers a comparative study of ancient Syadwad in the philosophical field and the more modern Theory of Relativity in the scientific world.

Similarity of Names

The term Syadwad is a combination of two words, 'Syad' and 'Wad'. 'Syad' is a preposition in Sanskrit synonym of "KATHANCHIT." It can be interpreted as 'in some context' or 'in some respect'. Hense

the 'ism' (Wad) or the system of thought which is based in determining the science of Reality on Relativity is Syadwad. This is the analytical meaning of the word.

The 'Theory of Relativity' can be translated in Hindi as 'Sapekshatawad' or 'Sapekshwad'. It also more or less means the same as Syadwad. If the two words are used synonymously there would not be any objection. This is the reason that Dr. Radhakrishnan has translated Syadwad in his "History of Indian Philosophy" as "Theory of Relativity." The very fact that the two theories originating from different premises converge in one name gives rise to a great amount of curiosity and speculation.

Both Easy and Difficult

Both the theories in their own respective fields have been proclaimed to be simple and yet difficult. Let us take Syadwad first. Its complexity is well known. Wherever the non-Jain scholars have tried to say something about it, their critical estimates reveal that they have not been able to grasp the real significance of Syadwad. M. M. Dr. Ganga Nath Jha, M.A., D.Litt., LL.D., Vice-Chancellor, University of Prayaga says: "When I read the logical opposition by Shankaracharya of the Jain Theories, I began to believe that there is so much in this Jain Theory which the Vedantic Acharya could not comprehend, and with whatever little knowledge of Jain Religion I have

today, I am confident that if Shankaracharya had taken the trouble of reviewing Jain Philosophy by its original tenets, he would not have thought it fit to oppose the Jain Religion."

Thus, Syadwad, because of its complexity has met too many such superficial preferences and discussions. On the other hand the Jain Acharyas have reduced this complexity to such a simplicity at places that even a layman can grasp the heart of Syadwad. For instance, when questioned as to how three mutually opposite properties viz., 'the beginning,' 'the end' and 'the permanent existence' could be found in the same thing at the same time, a Jain Acharya replied: "When a goldsmith was breaking a golden pitcher and making a golden crown out of it, three customers came to him. One wanted a golden pitcher, another wanted a golden crown and the third wanted only metallic gold. When they saw the goldsmith's activity, the first was sorry to note that he was breaking the pitcher, while the second was happy to note that he was making a crown. The third remained in an indifferent state of emotion because he wanted only metallic gold (in any form). It means that in the same gold, at the same time one is seeing 'the destruction,' (the end) the other 'the creation' (the beginning) and the third 'permanent existence' of gold. Thus everything in its own nature possesses the triple properties above-mentioned.

Making this elucidation still simpler, the Acharya said, "The essential liquid product from the cow was destroyed in the form of milk but was created in the form of curds and it continued to exist as a cow-product in both forms. One, who is living purely on milk will not take curds, one who lives purely on curds will not take milk and one who does not take cow-products avoids both. Thus these are qualified conditions of the negation of the activity named drinking."

Thus various contradictory qualities do exist in the same thing in various relative conditions. When a layman asked the Acharya about the nature of his Syadwad,[1] he raised his little finger and the finger near it and asked which was bigger out of the two. The reply was that the ring finger was bigger. He now raised only the middle finger and the ring finger and asked which was the smaller. The reply was the ring finger. Acharya said that this is our Syadwad. You yourself called the same finger bigger and smaller in different contexts. Syadwad is as simple as that.

The Theory of Relativity also is equally difficult as well as simple. It is so difficult that even great scientists have not been able to fully comprehend it. It is said, "It is so mathematical that only a few hundred men in the world are competent to discuss

1. Pragyasutra Vritti Pad Bhasa.

it."[1] One of the examples of the complexity of the Theory of Relativity is:[2] "If two people meet twice they must have lived the same time between the two meetings. This is true from one point of view and not from another. It all depends upon whether both of them have been staying-at-home or one has travelled to a distant part of the Universe and then came back in the interim."

Prof. Max Born has very humorously demonstrated the complexity of this Theory. He writes: [3]"A friend of min was once at a dnner-party and the lady next to him said : "Professor, do tell me in a few words what this theory of relativity really is."He replied: "of course, I will, provided you will let me tell you this little story first. I was going for a walk with a French friend and we got thirsty. By and by we came to a farm and I said : 'Let us buy a glass of milk here.' 'What is milk?' 'Oh, you don't know what milk is?' It is the white liquid that—' 'What is white?' 'White?, you don't know what that is either? Well, the swan—' 'What is swan?' 'Swan! the big bird with the bent neck.' 'What is bent?' 'Bent? Good heavens, don't you know that? Here, look at my arm : When I put it so, it 'is bent'. 'Oh that is bent. Is it? Now I know what milk is!' After hearing the story the lady expressed that she was now no longer interested in Relativity."

1. "Exploring the Universe" p. 257.
2. Cosmology old and new p. 206.
3. Ibid p. 197.

These are some of the examples of the complex nature of the Relativity. The instances of the simplicity of Relativity are not few. Only one example will suffice. Prof. Albert Einstein explained what is Relativity to his wife in these terms:—"I will give you one example. When a man talks with a beautiful girl he feels that an hour is just like a minute but if the same person is asked to sit on a hot oven, he will feel every minute like an hour." Syadwad and the Theory of Relativity are both easy and complex.

Empirical and Absolute Truth

There is a variety of divisions of the 'Nayas' or the logical viewpoints in Syadwad. But let us take only two out of them 'Nishchaya (Absolute) Naya' and 'Vyavhara (Empirical)[1] Naya'. The Acharyas have defined it as follows:— "Nishchaya Naya propounds the ideal and theoretical meaning of a thing while the Vyavhara Naya only reveals its practical meaning.[2] For example, once Gautama asked Lord Mahavira : "Respected Sir, how many colours, odours, tastes, and touch-sensations are possessed by the molasses?" Mahavira : replied, "I can answer your question from two viewpoints. From the point of view of Vyavhara Naya, it is said to be sweet, but from the point of view of Nischaya Naya, it contains all the 5 colours, 2 tastes, 5 odours and 8 feels. The next question from Gautama : was[3], "Sir, how many

1. Dravyanuyogatarkana 823.
2. Bhagawati Sutra 18-6.
3. Bhagawati Sutra 18-6.

colours are there in a wasp?" The reply was—"From the practical point of view, the wasp is black, i.e., having one colour but from the theoretical viewpoint, it contains black, white, blue and so on." Thus about the ash and the hair-broom, Lord Mahavir says that to say that it is dry and grey is 'empirical truth' but the 'absolute truth' is that it contains all the 5 colours, 2 smells, 5 tastes and 8 feels. The conclusion, therefore, is that the nature of things as comprehended by the sense-organs is quite different from its absolute nature. We can only grasp the superficial by our senses but the omniscient knows the external as well as the absolute nature in their right contexts. Prof. Albert Einstein, the protagonist of the Theory of Relativity, also says, "We can only know the relative truth, the Absolute truth is known only to the Universal observer."

In Syadwad, the instances of molasses, wasp, ash, broom, etc., illustrate the relative and absolute truth. Prof. Einstein has also used such illustrations to explain relativity; e.g., when we say that an event has happened today or just now, it may be that the event has happened before a million years. As for example: [1]"Two revolving galaxies (a and b) which are at a distance of thousands of light years, exploded and out of them two new stars were created. The spectators sitting in each galaxy will feel that these events are immediate but there being a distance of thousands of light years, betwen the two, the spector in '**a**' will call

1. Vishva Ki Ruprekha Adhyaya p. 62-63 (First Edition).

the event in **'b'** as happening after thousands of years; while a second spectator in **'b'** will similarly feel the explosion at its own place as immediate and the event in 'a' to have happened after thousands of years. Thus, about these explosions no absolute time can be determined but only a relative time can be stated." To clarify this illustration it is necessary to make an explanation. Modern science believes that light travels at a speed of 1,86,000 miles per second. A light year is the distance travelled by light in one year. There are galaxies in the universe which are at a distance of thousands of light years from each other. An event occurring in one of them can be seen after thousands of years by the residents of another. The substance is, that man, in such matters, accepts the relative truth. If a man on **'a'** happens to meet a man on **'b'**, probably their conclusions will be contradictory to each other while both will be correct from their own viewpoints.

"The doctrine of seven prediction" of the Syadwad dialectics accepts the existence of a thing in concomitance of its own substance, place, time and mode; and its non-existence in concomitance of the substance etc. of the non-self. For example, we predicate that a pot is made of earth, made in Rajasthan, made in summer and made of a particular white colour and of a particular name. The same pot at the same time can be described by another person as a pot not made of gold, not made in Vidarbha, not made in

winter, not black and not having a particular name. In this way, the existence and non-existence of the pot are related to space, time, etc.

Like Syadwad the Theory of Relativity is also full of such illustrations which are supported by the logic of Nayas and the doctrine of seven predictions. Thus Prof. Eddington, explaining the relative position of space : writes :[1] "A more familiar example of a relative quantity is 'direction' of an object. There is a direction of Cambridge relative to Edinburgh and another direction relative to London, and so on. It never occurs to us to think of this as discrepancy or to suppose that there must be some drection of Cambridge (at present undiscoverable) which is absolute." In the same book, he further explains the difference betwen 'absolute truth' and 'empirical truth' as follows : [2]"You receive a balance sheet from a public company and observe that the assets amount to such and such a figure. Is this true? Certainly ; it is certified by a chartered accountant. But is it really true? Many questions arise; the real values of items are often very different from those which figure in the balance sheet. I am not especially referring to fraudulent companies. There is a blessed phrase "hidden reserves"; and, generally speaking, the more respectable the company the more widely does its balance sheet deviate from reality".

1. The Nature of the Physical World p. 26.
2. Ibid p. 33.

In the field of Syadwad, Lord Mahavira also has replied to many questions in different contexts in different ways. The basic tenets of the universe and its creation are also explained relatively. When asked[1] whether the ultimate atom of matter is permanent or transitory, he replied that it is both. From the viewpoint of substance it is permanent; but from the viewpoint of its external properties like the colour etc., it is transient. It is changing at every moment. The same reply has ben given by Lord Mahavira about the nature of the soul. Einstein also asserts that natural studies are relative. In the very first postulate of Theory of Relativity, he says that, [2]"Nature is such that it is impossible to determine absolute motion by any experiment whatever." Why so? In reply to this question, whether the determination of absolute motion is possible, Sir James Jeans says, [3]"Rest and motion are merely relative terms. A ship which is becalmed is at rest only in a relative sense—relative to the earth; but the earth is in motion relative to the sun, and the ship with it. If the earth were stayed in its course round the sun, the ship would become at rest in relation to the sun, but both would still be moving through the surrounding stars. Check the sun's motion through the stars and there still remains the motion of the whole galactic system of stars

1. Bhagawati Shatak 7, Udeshak 2.
2. Mysterious Universe. P. 78.
3. Bhagwati Sutra 14-34.

relative to the remote nebulae. And these remote nebulae move towards or away from one another with speeds of hundreds of miles a second or more; by going farther into space we not only find no standard of absolute rest, but encounter greater and greater speeds of motion."

The conclusion is that according to Relativity every planet and material object is mobile as well as immobile. The believers in Syadwad also say the same about the constant and yet ever changing atom. The universe is eternal but at the same time in a flux. It is not necessary to see whether the conclusions of both these theories are acceptable to each other; but what is important is to see that methodologies of both Syadwad and Theory of Relativity are very similar. Both depend on the logic of relativity. As Syadwad talgs of being and non-being at every step, the theory of Relativity also deals with 'is' and 'is not' in every premise. [1]For example, when normally we say that a thing weighs 194 lbs., according to Relativity, this may or may not be correct. For a weight of 194 lbs. at the equator, may weigh 195 lbs. at the poles. Apart from the position of the observer, it also depends upon the state of the body, whether it is at rest or in motion. Another example is[2] "Suppose this room is a lift; the support breaks and down we go with ever-increasing velocity, falling freely like a stone. Suppose I am inside the lift and I perform

1. Cosmology old and new p. 205.
2. *Ibid* p. 40.

the experiment of dropping an apple held in my hand. Remember that the lift and all things contained in it are falling frely all the while. To my surprise I shall se that the apple cannot fall any more than it is already doing, owing to the free fall of lift. The apple remains poised in my hand." Thus the gravitation 'exists' and also 'does not exist. It should be borne in mind that we have taken gravitation as an illustration. Actually Einstein has annihilated its very existence from the field of science. Syadwad says that in conclusion we may take it for granted that things are "Anant Dharmatkam," i.e. having infinite attributes. They have infinite modes and particulars. Whenever we talk about a thing, we consider one of them as principal and others as subsidiary. Our truth therefore is relative. The same thing may be different from different points of view. [1]The orange is bigger than the lemon, but from the viewpoint of the material attributes, the orange contains bigness as well as smallness. The smallness of the orange is revealed when it is compared to a water-melon. Thus the terms smallness or bigness as used in daily practice are only relative. The ultimate bigness is in the universal immanence (Mahaskandh) and the ultimate smallness is in the atom of matter.[2]

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1. (Shri Jain Siddhanta Deepika Prakasha 1, Sutra 12).

2. The atom of matter (Paramanu) should not be confused with the atom of an element which is composed of infinite number of Paramanus. A Paramanu is the ultimate and indivisible particle.

Now, compare this with the statement of the famous scientist Einstein:—[1]"I think we often draw a distinction between what is true and what is really true. A statement which does not profess to deal with anything except appearances may be true; a statement which is not only true but deals with the realities beneath the appearances is really true." Looking at this astonishing similarity in Syadwad and the Theory of Relativity, one comes to the conclusion that Syadwad is not merely a collection of partial truths but is the true way to know the real nature of things and it was discovered thousands of years ago by the Jain philosophers. The applicability is as much philosophic as it is scientific. It is not merely a bundle of conjectures but is a practical way of life. The Acharyas have, therefore, said—"Bow to that great theory, Syadwad, which has been a guide to the world and without which the common man's behaviour cannot be also determined."

Thousands of years ago and today

Like the Ganges and the Yamuna, many phases of the Theory of Relativity and Syadwad flow together. The difference is only that in Syadwad they were systematically arranged thousands of years ago while in the theory of relativity they are still in the stage of thinking and gradual development. For example, discussing about the errors in Geometry and measure-

1. Cosmology old and new p. XI.

ments in the light of Theory of Relativity, discussing about the errors in Geometry and measurements in the light of Theory of Realativity. It is said that in Geometry a line is that which has length but no breadth or width and a point has no length even. But in practice there is no such visible line which has no breadth or width. It may be negligible or very fine but it cannot be said that it is not there. The same is the case with the planes in space. May be that our brains may think only of length or breadth (without thickness) but nature has not made any such thing which has only two dimensions. If we see a straight line drawn on a paper, we think that its straightness is natural. But if mocroscopically examined, the so-called straight line will not be so straight a line as we think it to be.

The same is the case with measurements. The length, breadth and width are meant to define point, line, planes etc. We do not look at them in their real relative position but in the context of an ideal norm. For measuring length, a fixed ideal norm is not available. Even the most solid metallic wire or rod of iron or brass expands or contracts by a ten millionth part of its length, by merely turning it from one direction to another. Even the measurement of same land by different people at different times is not always the same. You may put a mark by glass or platinum or you may measure it by the best instrument, yet there is always some discrepancy left in different measure-

ments. It has already been said above that length differs with direction. Similarly, with the change in temperature, metals expand and contract. In the course of time, the internal changes in molecular arrangements also result into changes in measurements. And land is not even as solid as platinum. It goes on changing and if the person who measures does not really depend upon his instruments, each man will have his own independent scale and measurement. When we determine the truth of any measured weight or dimensions, we do not determine its absolute correctness because this value is only in man's mind and nowhere else, nor do we reject the results of these measurements as absolutely false. Our real norm is that, which is an average of different scales or measurements. More the number of measurements done with greater accuracy, more reliable will be the average and the measurements nearest to this average will be most correct. It is' thus' established that the logicians have tried to prove the reality without proper analysis and on the basis of mere inference. So they are not to be relied upon for their own words. The definition given above by us may be correct if we call them relative truths and do not insist on calling them absolute truths. Some lines may be more straight than the others which are more curved. We may consider the length and breadth of some point or line as immeasureably finer in comparison with other points or lines which are visible. Thus all our measurements and weights are relative. Syadwad

is also full of such relative hypothesis. In the Jain Agam entitled "Shri Pannavana", truth has been divided into ten categories. While the Theory of Relativity hesitatingly admits the practical measurements and weights in the ultimate truths, the Jain Agamas have divided almost all relative truths into ten sub-divisions as follows :

1. **Janpad Satya (Spatial Truth)**—Different lands have different languages. Thus different things have different names which are true in their own contexts. Sometimes, some words are such which contradictory meanings in different countries. In some lands, Bapu means father ; in others, the same word may mean a small child. But both the meanings are not incorrect in their own contexts.

2. **Sammat Satya (Common Truth)**—By vox populi certain words become current in language. In Sanskrit 'Pankaj' a literary means that which is born in the mud. The lotus is generally known by this name, though the frog is also born in the mud, it is not called pankaja.

3. **Nam Satya (Nominal Truth)**—Supposing somebody's name is Vidyasagar (the ocean of knowledge). He may not be knowing even A.B.C. Yet all people call him Vidyasagar and they are not false, because their truth is merely nominal. Name is merely a sign for cognition of an individual. So, it is not always seen whether the name corresponds

to the actual life or how far it is true in the case of that person.

4. **Sthapna Satya (Hypothetical Truth)**—We take for granted certain things; for example, a foot is equal to 12 inches or a yard is equal to 3 feet; a seer is of so many tolas and a maund is of so many seers; but all these suppositions or arbitrary beliefs are different from the points of view of space and time and so they are true as far as they are practical. All measurements, weights and mathematical suppositions are relative. In the measuring-rod every moment there is some difference being created when looked at from a very fine point of view, but as long as it is practically useful, the same measuring rod is considered as true. In truth, as the Theory of Relativity presumes moment to moment change in every measure, Theory of Syadwad goes very deep and scientifically discusses in details the dynamic nature of things. Syadwad defines that a thing is dynamic by nature in which every moment a new mode is born, the old mode is destroyed and yet the basic substance continues to exist. Both Syadwad and the Theory of Relativity agre on this principle of moment to moment change, or the dynamic nature of things and support each other thereby.

5. **Roopa Satya (Formal Truth)**—Such statement which is merely relative is formal. For example, on the stage the actors are taken to be real by the spectators. In a Ram-Lila, one person is considered to be Rama and another as Sita; but in reality both of

them are neither Ram nor Sita.

6. **Pratiti Satya (Imperial Truth)**—This also is relative. Our sense-organs experience bigness or smallness relatively. The nut is smaller than a mango but it is bigger than a seed.

7. **Vyavahara Satya (Practical Trth)**—In common parlance common-sense truth is the practical truth. When we ask where does this road go? Actually, it is not the road which is going but it is the person who walks on it. The tired traveller reaches a village and says—"Oh, the village has come." Nobody asks him whether the traveller has come or the village. By common-sense standard and practical utility, such statements are not unjustified. So, this also is a part of truth.

8. **Bhava Satya (Qualitative Truth)**—The statement like the swan is white or black is relatively true in the context of sense-perception but here also the external broad general point of view is different from the absolute truth. Both swan and carbon-black possess all colours according to the latter.

9. **Yoga Satya (Collective Truth)**—The thing may be made of two or more things in the beginning but afterwards even when the addition is not there, the word is used as a true word. For example a Dandin originally means one who carries a stick but afterwards it is commonly used for all kinds of hermits with or without sticks.

10. **Upama Satya (Analogical Truth)**—All

literary figures of speech like similie and metaphor are included in this. It is again divided into four kinds—the analogy may be real, the thing to which the analogy is given may be unreal; the thing of which the analogy is given may be real or unreal; both may be real or unreal.

Thus Theory of Relativity and Syadwad are like the Ganges and Yamuna in confluence at various places.

Absolute or Perfect Truth

Dr. Radhakrishnan, the famous thinker of India, writes about the Theory of Syadwad in his famous book[1] "The theory of relativity cannot be logically sustained without the hypothesis of an absolute.... The Jains admit that things are one in their universal aspect (Jati or Karana) and many in their particular aspect (Vyakti or Karya). Both these, according to them are partial points of view. A plurality of reals is admittedly a relative truth. We must rise to the complete point of view and look at the whole with all the wealth of its attitudes. If Jainism stops short with plurality, which is at best a relative and partial truth, and does not ask whether there is any higher truth pointing to one which particularises itself in the objects of the world, connected with one another vitally essentially and immanently, it throws over board its own logic and exalts a relative truth into an absolute one.

1. Indian Philosophy Vol. I p. 305, 306.

This seems to be a prejudice which great thinkers like Shri Radhakrishnan have formed. The Theory of Relativity may inspire him to think again and change his views about Syadwad.

While he feels that the hypothesis of absolute is unavoidable, the Theory of Relativity maintains that [1]the absolute is merely a mental creation. When we try to super-impose the absolute on natural objects and rules, not only we leave the ground of the material reality and soar in the abstract skies but we also fall a victim to false concepts. But it is true that relativity does not accept the absolute existence of anything. But to say that it negates the existence altogether is to go beyond its limits. After all why one has to believe in Relativity? It is simply because the non-absolute nature of things compels us to do so. Thus, the Theory of Relativity fully falls in line with and supports Syadwad. Even before Theory of Relatiitvty, Syadwad had in itself such self-sufficiency that the logic of Radhakrishnan cannot weaken it. When Syadwad itself takes for granted that there is no absolute truth in the world, why should the love for such an absolute truth be so constant in our mind? Dharmakirti says that "if the things themselves prefer to have a non-absolute nature who are we to declare them as non-relative and absolute?"[2] Pro-

1. Vishva ki Ruprekha p. 57-58.
2. Pramanvartika 2-209.

bably the doubt in the mind of the thinkers is due to the reason that the 'relative truth' is considered to be different from the 'perfect truth' or the absolute truth; but in reality the 'relative truth' is not different from them. Every person can easily understand that the orange is small or big in size. Here the real and absolute truth is only this that it is both small and big in relation to the things bigger or smaller. If some one says that this is a relative or partial truth we can counter question him "to define his absolute or perfect truth."

Some [1]Jain scholars have tried to delimit Syadwad to mere practical matters and shown 'Nishchaya Naya' in Jain philosophy to be the 'absolute truth' with a view to justify the criticism of Radhakrishnan. But it is not true to say that Syadwad is merely applicable to daily practice because all exist and yet all does not exist—which means that there is neither absolute existence nor absolute non-existence. In concomitance of its own substance, space, time etc., everything exists and from the viewpoint of time, space quality etc., of non-self, everything does not exist. Thus the seven-faced soul of Syadwad does not apply merely to practical matters but to the very nature of things itself. Hence the Acharyas have said, [2]"From the lamp to the sky everything is stamped with Syadwad or non-absolutism."

1. Syadvadmanjari—Translated by Shri Jagdish Chandra Jain M.A., p. 25.
2. Anyayogavyavachhedika, S. 5.

The essential truth known by the omniscient and proved by the 'Nishchaya Naya' is also nominally unrelative or absolute. It is also not beyond the category of non-absolute existence and non-existence. Thus the manifesto of Syadwad that all truth is relative and perfect or real truth is not different from it, is obvious and it is logically tenable on the tests of modern Theory of Relativity.

In the Eyes of the Critics

Both Syadwad and Theory of Relativity have had to suffer a lot of opposition in their own fields from their respective critics. The criticisms levelled at both are almost the same. Both systems of thought have been opposed by great scholars because of their complexity but such criticism shave proved to be puerile and based on ignorance. For example, a great scholar like Shankaracharya wrote indiscreetly without grasping the very essence of Syadwad—"When the means of knowing the subjects and the process of knowledge are all indefinite how can a Tirthanker authoritatively sermonise on any subject and even follow the precept?" In the same way, Prof. S. K. Belwalker writes in another context, "The portion of Jain Philosophy dealing with knowledge, as based on Syadwad, is incorrect and incongruous. 'S' can be, 'S' cannot be, both can be; all this can and cannot be 'P' at the same time. In this way, a negative and agnostic assertion cannot be called a theory." In the same way, some people have also said that it is a strange

thing that according to Syadwadis the curd and the buffalo are one and the same, but they eat the curd but do not eat the buffalo and therefore, 'Syadwad' is false. But all these objections to Syadwadis seem to be childish. Shankracharya confused Syadwad with doubtfulness or indefiniteness. Probably, he mistook "It exists in some context" to mean that "it perhaps exists." But Syadwad is quite opposite to doubtfulness. According to Syadwad, things do possess innumerable mutually opposite qualities. When we make an assertion, it is in the context of one particular mode, but at the same time there are other modes existing in the same thing. Therefore, the predication that it "exists in 'some context'" is fully justified. Surely, there is no occasion for indefiniteness or doubtfulness, because a Syadwadi is very fastidious about his language. Thus a person believing in Syadwad will say while giving any judgement about a thing that "it is so in some context." The question may arise as to why this 'in some context' is mentioned at all. The answer is that there will be utter confusion without it. The question whether a particular line is short or long will not arise at all as long as there is no second line in our mind, even in imagination. In this case, it is not an indefinite judgement or disjunction but it is a stark reality when we say that the line is and also is not short or long.

Let us apply this to the arguments of Sri S. K. Belwalker. The same ilne is long or short or neither

long nor short in relation to another; in a particular context short or long or equal line; the letter 'S' may be a letter of the alphabet from the point of view of the English language but of the same shape is a **'pluta'** or **'avagrah'** sign in Sanskrit language. The same thing is having two meanings from the viewpoints of two languages. Syadwad is not merely a conjecture or an imaginary concept but an intelligible theory of every day life. Without understanding the essence of 'is' and 'is not', people have doubted it as a dubitable state of mind. But when applied to real thinking this principle is as true as 2 plus 2 is equal to 4. Everything "is" from the relative angle of its own matter space, time and quality but is also 'is not from the angle of matter, space, time and quality of the other thing. The curd and the buffalo are one as far as they are both material things but they are not the same as far as the curdness and the buffaloness is concerned. Curd is eatable because of its curdness and not because it is a material thing. All material things are not eatable. Hence, it is absurd to bring the curd and the buffalo together in every context.

The History of the criticism of the Theory of Relativity is also equally interesting. Today the theory of Relativity is accepted by all as a perfect mathematical theory in the scientific world, and it is also believed that it is one of the greatest discoveries of this century and probably the "farthest reach that

the human mind has made into the "Unknown".[1] Yet in understanding the complexity of this theory many a critic are very much opposed to this theory. The famous experienced engineer, Sydney A. Reeve said, "Einstein's theory is arrant non-sense."[2] Philosopher Gaganhammer wrote: "Einstein has made a very silly basic error in logic."[3] Thus like Syadwad, the Theory of Relativity had been adversely criticized but now in the scientific world it has been accepted universally as a great theory of the Twentieth Century.

Conclusion

Some thinkers are of the opinion that relativity and Syadwad cannot be compared because Syadwad is a spiritual theory and the Theory of Relativity is material. The truth is that both the theories are merely methodological and hence none of them is limited either to spirit or to matter. It should be noted that it is wrong to suppose that Syadwad is limited to spiritualism. By its very nature, it is as much related to spiritual as to material objects. When it passes judgement on both it is quite clear that it is as much spiritual as material. But as the scientists consider only physical science as the field of their knowledge, the field of the Theory of Relativity has been limited to matter. Relativity is also a

1. Exploring the universe p. 257.
2. Cosmology Old and New, p. 197.
3. *Ibid,* p. 197.

system and to judge everything and to call the system to be spiritual or material has no meaning. Even accepting it to be only a material system, the matter from microcosmos to macrocosmos is the subject of both the theories. Thus to make a comparative study of both these systems of thought has its importance. Thinkers should pay more attention to it.

The amazing similarity between Syadwad and Relativity revealed to us various aspects of thinking. Today, the 'chasm' between philosophy and science is widening but if our thoughts flow in the same direction in the future, this difference will be reduced.

The mistaken belief that Syadwad is cynicism or agnosticism will be removed by the scientific nature of relativity.

Those who discard philosophy and believe in science only, will get food to think after reading this comparative survey of Syadwad and relativity that philosophy is not merely "will-o'-the-wisp" but is a progressive way of thinking and it is in the same direction in which the science is endeavouring to proceed. An impartial thinker will realize that Syadwad, after gaining victory in the field of philosophy has re-appeared as the Theory of Relativity to gain victory in the field of science.

CHAPTER 3

THEORY OF ATOM

Discussion about atoms and electrons is going on in this world right from the world-famous laboratories to the humble cottages of the workers and farmers. The nuclear tests of the atom bombs and hydrogen bombs, taking place from time to time, reveal the all destructive nature of atomic energy and remind us of the destructive power of Lord Shiva, the God of Destruction in Hindu Mythology. The progress of the Nuclear Physics has aroused in us a curiosity to know about the power, the structure, the nature and the origin of atom. When did atom appear in the field of science? Who discovered it? How the nuclear science has reached the present stages of its development?, and how in the field of philosophy also, right from pre-historic to the modern age, deep thinking and researches have been made on the structure of matter, atoms and the ultimate particles comprising atoms? The simultaneous exposition of these two aspects will have a special importance of its own. At the same time, it would become apparent as to who of the two—the

*The word 'Paramanu' is used in this book to indicate the infinitesimal, indivisible mint of matter and to differentiate it from atom, which is an aggregate of infinite number of 'Paramanu'.

scientists or the philosophers—have gone deeper into the microcosmos.

Philosophical Viewpoint

Whereas, in the western world, it is indisputably believed that it was Democritus (B.C. 460-370) who first spoke about the atom; in India, the history of atom, even centuries before that, is available. No particular mention about atom is made in any other Vedic Philosophy except in the Vaisheshik Philosophy. In the Jain philosophy, however, a very elaborate and systematic exposition about the structure of atoms and the fundamental, indivisible particles of matter (Paramanu) is to be found.

According to the Jain scriptures, Jainism is eternal; 24 Tirthankaras appear in each of the two cycles of time, the ascending and the descending cycles. The historical viewpoint about Jainism has also progressed a great deal. Some scholars have begun to write about Jainism that, "It is older than Hinduism or Buddhism."[1] In the field of history, it has now become an universally admitted fact that Jainism has a pre-historic origin. In the ancient history of India, which is traced at the most up to five thousand years, Jainism is proved to be existing throughout. Hence, the existence of atomic Science also becomes very ancient along with the Jain Philosophy. So long, the historians used to men-

1. A History of Philosophical System, p. 6.

tion only the 24th Tirthankara, Lord Mahavira. But recently, the western scholars have already admitted that the 23rd Tirthankara, Lord Parsvanath, who was a prince of Kashi State, was a person with historical importance.[2] His period is 842 B.C., which is 382 years prior to Democritus. From the Jain scriptures, it is very well proved that all the main tenets of Mahavira and Parasvanath agree with each other. Even if we connect the present Jain Philosophy with Lord Mahavira (598-526 B.C.), his period is about a century prior to Democritus, the so-called discoverer of atomic theory. It becomes clear, therefore, that only the lack of historical knowledge is responsible for the notion that: Democritus discovered atom.

Lord Mahavira expounding the 'Atomic structure of Matter', to his disciple Gautama, says—There are six kinds of substances in the universe:

1. Dharmastikaya—Medium of motion for soul and matter.
2. Adharmastikaya—Medium of rest for soul and matter.
3. Akashastikaya—Space.
4. Pudagalastikaya—Matter and Energy (Inanimate objects).
5. Jivastikaya—Soul (Animate objects).

2. History of the World by Harmsworth, Vol. II p. 1198.

6. Kala—Time.

In the Jain philosophy, 'Pudgala' is considered to be one of the six fundamental substances, which constitute the universe. 'Pudgala' is a technical Jain word. The usage of this word is not found in any other philosophy. In Buddhist Philosophy, no doubt, this word has been used, but in quite a different sense. 'Pudgala' is a synonym of the word 'Matter' in modern science. Although it is a technical word, it has a grammatical derivative, meaning and origin. The word 'pudgala' has the following derivation.[3]

Pudgala i.e. 'pud' means 'to combine' and 'gala' means to dissociate , the two words combine together to form "Pudgala". Hence, the basic meaning of the word Pudgala is: "that which undergoes modifications by combinations and dissociations."[3] Similarly in "Tattvartha Rajavartika", "Dhavala Granth", "Harivansha Puran", "Siddhaseniya Tattvartha Tika", and other works, 'pudgala' has been so named on account of its nature of association and dissociation.

Defining the nature of Pudgala in the original Jain scriptures, it is said that [4]"Pudagalastikaya is perceptible by the senses, it possesses five colours, five tastes, two odours and eight touches; it has form; it is lifeless; it is permanent in its nature, definite in

3. Shabda Kalpadrum Kosha.
4. Bhagwati Sutra 2-10.

number (or quantity) as one of the constituents of the universe. It can be described collectively from five points of view:

(1) From the point of view of Substance: 'Pudgala' is infinite in number.

(2) From the point of view of Space: 'Pudgala' is pervading throughout the universe.

(3) From the point view of Time: 'Pudgala' has an eternal existence, which never ceases to exist.

(4) From the point of view of Quality: 'Pudgala' possesses colour, taste, odour, and touch.

(5) From the point of view of Attribute: Its attribute is, that it is 'perceptible.

Briefly, the definition can be given that: [5] "A substance, which possesses touch, taste, odour and colour, is 'pudgala'. According to Jain view, out of the six substances, 'pudgala' is the only one, which possesses form and becomes visible. In other words, it can be said that pudgala is that which can be seen by the eyes, heard by the ears, tasted by the tongue, smelt by the nose, and can be felt by touch on account of its quality of perceptions such as hotness, coldness, smoothness or coarseness etc. The result is ,that the

5. Shri Jain Siddhanta Dipika 1-15.
6a. Vrihad Dravya Sangrah 15.
b. Tattvartha Sutra 5-4.

'matter' in modern science and the pudgala in the Jain philosophy are one and the same thing.

Four Divisions of 'Pudgala'

The 'pudgala', as a substance, which is pervading the whole universe, is called "pudgalastikaya". From the elementary indivisible particles, to the entire substance, it can be classified in four division:[7]

(1) Skandha, (2) Skandha-desha, (3) Skandha-pradesh, (4) Paramanu.

[8]SKANDHA: Skhandha is defined as an individual aggregate formed by combination of elementary particles. [9]In other words, Skandha is an association of two or more up to infinite number of paramanus. In addition to this, it should be understood that, [10]just as skandha is the combination of two or more paramanus, the same is the entity formed by the combination of two or more skandhas themselves; and in the same way, the decomposition of a 'skandha' into entities consisting of more than one paramanu, are also 'skandhas'. Thus a 'skandha' consists of a minimum of two paramanus and is called a 'dvi-pradeshiya skandha'. Sometimes, it so happens that infinite number of paramanus join together naturally, forming a 'skandha' whose volume is equal to the volume of universe, and this is called 'Ashes Loka Vyapimaha Skandha'.

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7. Bhagwati Sutra 2|10|66.
8. Shri Jain Siddhanta Dipika 1-11.
9. *Ibid.* 1-15.
10. *Ibid.* 1-16.

SKANDHA-DESHA : As said above, a skandha is an entity. An imaginary portion of this entitley is called "skandha-desha".[11] As for example, when we imagine or consider half the part of a stick or when we say that this is one page of a book, that portion of the stick or page is called 'desha'. Thus, a book is a 'skandha' and a page of it imaginatively separated by us, is a 'desha'. The result is, that what we call 'desha' is not detached from the whole; when, it is bodily detached from the skandha, it becomes a 'skandha' itself.

SKANDHA-PRADESHA : According to Jain Micro-Cosmology, the fundamental matter, of which every material object (skandha) is composed, is called 'paramanu'. So long as the 'paramanu' remains attached to the 'skandha', it is called 'pradesha'. In other words, we can say that, the minutest, indivisible but undetached portion of a 'skandha', is called "Skandha-Pradesh."[12]

PARAMANU: "The infinitesimal part of a 'skandha', which cannot be further sub-divided is a 'paramanu'."[13] So long as it remains attached to a 'skandha', it is called its 'pradesha', while in its free or unattached state it is known as a 'paramanu'. The nature and properties of a 'paramanu' are discussed and revealed in various ways by the Philoso-

11. Shri Jain Sidhanta Dipika, p. 1-S. 22.
12. Shri Jain Sidhanta Dipika p-1-S. 23.
13. Shri Jain Sidhanta Dipika p-1-S. 24.

phers. Paramanu[14] the ultimate particle of matter is indisivisble, inseparable, impenetrable, incombustible and imperceptible. That is, it cannot be split by any means or instruments, whatsoever. Even the greatest electrical force cannot split it; the sharpest weapon cannot divide it in two; it can rest on the sharpest edge of a sharp weapon; a Paramanu resting on the edge of a sword or a razor, cannot be divided; it will not be burnt by the hottest centre of a fire; it will not become wet, even if it enters the "pushkaravarta mahamegha" (the cloud, which can bring deluge on the earth by incessant rains); it will not be destroyed, even if it enters the speedily moving opposite current of the Ganges or Niagara falls; it will not lose its existence or identity even if it enters a drop of water or a whirl-pool of water.[15] Again 'Parmanu' has no half-portion; it has no middle portion; it has no pradeshas. It has no length, no breadth, no depth. It is dimensionless." It always exists as "a unit".[16] "On account of its minuteness, the beginning, the middle and the end of of it are identical with the whole of itself. Hence, the scholars have observed:[17] "That, of which the beginning, the middle and the end are the same i.e. which itself is middle and itself is the end; that which is not perceptible by senses; and that which is indivisible,

14. Bhagwati Shataka 5, U. 7.
15. Bhagwati Shataka 5, U. 7.
16. Rajvartika —5|25|1.
17. Sarvarthasiddhi Tika Sutra 25.

is called a 'paramanu'." In Panchastikaya-sara, some other characteristics of paramanu are also enumerated—"The substance, which has a single taste a single colour, one smell, and two kinds of sparsh (Eutaneous or touch sensation), which is the cause of sound, but is not sound itself; which is different from skandhas (aggregates of elementary particles) though constituting them, is the 'paramanu'."

The four sense-data—touch, taste, odour and colour of the four senses viz. touch—sense etc., respectively, are present in minutest quantities in a 'paramanu'. Only the subject of the sense of hearing viz. sound, is not associated with 'paramanu' because sound is an attribute of skandhas only. 'Paramanus' can only be called as one of the causes of the sound. Although colour, odour etc. of a single 'paramanu' cannot be perceived by their respective senses, they are always there as its principle characteristics.

Properties of Paramanu

When we talk of ultimate indivisible portions, we have four types:[18]

(1) 'Dravya Paramanu', or 'pudgala paramanu' —Infinitesimal indivisible unit of matter.

(2) 'Kshetra paramanu' or 'Akash paramanu'— Infinitesimal indivisible unit of space or space point.

18. Bhagwati Sutra—20|5|12.

(3) 'Kaal paramanu'—infinitesimal indivisible unit of time, called 'Samaya' or 'Time-point'.

(4) 'Bhava paramanu' or 'Guna'—Primary unit of potency of qualities.

'Bhava paramanu' is again divided into four kinds: [19] (1) having the quality of colour, (2) having the quality of odour, (3) having the quality of taste and (4) having the quality of touch.

These, again, can be further subdivided into 16 types: (1) one unit black, (2) one unit blue, (3) one unit red, (4) one unit yellow, (5) one unit white, (6) one unit good smell, (7) one unit bad smell, (8) one unit pungent, (9) one unit sweet, (10) one unit bitter, (11) one unit acidic, (12) one unit astringent, (13) one unit hot, (14) one unit cold, (15) one unit adhesive and (16) one unit dry. In short, the 'paramanu', propounded in Jain Philosophy, possesses colour, odour, taste and touch, which are the essential permanent properties of matter 'pudgala'.

In a single 'paramanu', colour, odour, taste and touch etc. are found thus—only one colour out of the above five colours, only one smell out of the two smells; only one taste out of the five tastes and only two touches out of the four touches; anyone from the pair of adhesive and dry and any one from the pair of hot and cold.

19. Bhagwati Shataka 20, U. 5.

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NAG

In the commentary to the cannonical texts, the 'paramanu' is defined thus: 'Paramanu' is the ultimate cause of the formation of a 'skandha' i.e., it is the primary element in every material substance. It is the minutest particle of all matter; it is eternal i.e. it existed in the past, it exists in the present and it shall exist in the future; it possesses a single colour, a single odour, a single taste and two touches; it is perceivable only by its effects i.e. a single atom cannot be seen by the eyes or any other physical instrument. Its existence is to be known by the collective actions and reactions of several 'paramanus'. "Only the omniscient and those who possess a very high degree of "visual intution (param avadhi jnana), can perceive and cognate the nature of a single 'paramanu'."[20]

Disparity among "Paramanus"

Until recently modern chemistry believed that there are 92[21] independent elementary atoms of matter or elements. But, Jain Philosophy never believed in such uninterchangeability of 'paramanus'. According to Jain view, in course of time, any atom can transform itself into another one, which may be totally dissimilar to the former. Very recently, this view, viz., transmutation of atoms, has been accepted by the most modern physics and chemistry. All 'para-

20. Bhagwati Shataka 8 U. 18.

21. Upto now the science is able to find 102 primary elements.

manus' do not possess similar attributes in respect of colour, smell etc. One paramanu has blackness; another has yellowness or whiteness; yet another has blueness; one may have good smell; another may have bad smell; one may have a pungent taste while another may have a bitter taste; one may have an adhesive touch while another may have a dry touch. Thus, there are various types of 'paramanus'. It is further established, that even the paramanus which have the same colour and odour, etc. may differ from one another on account of their infinite disparity in potency or magnitude and thus there are infinite kinds of 'paramanus'. As for example, consider all the black 'paramaṇus' of the universe: they are not all equally black; some paramanus have one unit of blackness, while others have two units of blackness; similarly some may have 100 units, some may have thousand units, some may have countless units, while some may have infinite units of blackness. This is an instance regarding a colour. In the same way, if we consider other qualities viz. odour etc. the 'paramanus' may differ from one another and the degree of difference may be from one unit to infinite units. And this degree or intensity of any quality, in the same 'paramanu', also is not eternally the same but goes on changing. A 'paramanu' possessing one unit of or minimum adhesiveness may in course of time, become possessed of infinite units or interest adhesiveness and vice-versa. This change in intensity of quality is called "Sixfold increase or decrease" and

is due to the very nature of things, and hence occurs without outside cause.

Why and How Skandhas or Aggregates are formed from Paramanus.

It is a matter of great importance that when each 'paramanu' is like a brick in an edifice, an independent indivisible unit, then how do they join together and form vast aggregates (skandhas) like galaxies. In erecting an edifice not only separate bricks are necessary but we also require mortar, cement and such other bonding substances and also a mason who joins and puts them together. In this infinite universe, composition and decomposition of aggregates (skandhas) occurs every moment. A cloudless sky is found to be full of clouds within a short space of time i.e., the skandhas in the form of clouds are combined together and within some more space of time they are seen to disperse also. What is the cause of this natural formation of skandhas? Whatever thing appears before a man in a form and which man thinks to be an original thing, is, but the actual effect of the joining together of the 'paramanus'. Jain philosophers have enunciated the following rules for the formation of aggregates. (Skandhas).[22]

(1) In the formation of a skandha, the only effective quality is the adhesiveness or dryness of the Paramanus.

22. Shri Jain Sidhanta Dipika—p. 1.

(2) An adhesive 'paramanu' may join with another adhesive 'paramanu' to form an aggregate. But there is one condition in such combination, viz., there must be a minimum difference of two units in the adhesiveness of the two 'paramanus'.

(3) A dry 'paramanu' may join with another dry 'paramanu' to form a 'skandha'; but here also the condition is that there must be a minimum difference of two units of dryness of the two 'paramanus.'

(4) Adhesive and dry 'paramanus' do join together to form a 'skandha'; they may be of the same intensity of adhesiveness or dryness or different intensities.

The only exception to the above is that none of the 'paramanus' should possess only one unit of adhesiveness or one unit of dryness. This method is also described in Gommatsar at 615th verse which means: An adhesive 'paramanu' with a difference of two units may combine with another adhesive one. And this is also the rule in the case of dry ones. The combination of an adhesive 'paramanu' with a dry one is always possible, they being of the same or different intensity. But in all these three the 'paramanu' with the minimum intensity i.e. one unit of each, should be excepted.

These eternal denizens of this endless universe are naturally roaming about. The entire universe is

filled up with 'paramanus'. When they naturally meet and join together, according to the above principles, different aggregates 'skandhas' are formed.

The motion and action of a 'paramanu': Although inanimate, a 'paramanu' is mobile. Its motion may be spontaneous or caused by outside forces. Its motion is not eternal i.e., it is sometimes in motion and sometimes at rest. It is also active. Its actions are spontaneous and of various kinds. According to the Bhagwati Sutra, it sometimes vibrates; sometimes it vibrates and also rotates and so on, up to the time when it changes its modes and attributes. By the word 'so on' here we understand that besides simple and compound vibrations of various kinds, there are many other activities; but what these activities are is a matter of research. Commentator Abhaya Deva Suri also has, in his commentary, suggested investigation in this field.[23]

The question now arises as to whether the motion of a 'paramanu' takes place by itself or is caused by a Jeeva (living being). The answer is—"No action or motion in a 'paramanu' is the possible effect of an action of Jeeva, because a 'paramanu' is incapable of being assimilated by a 'Jeeva' and without assimiatlng it, 'Jeeva' is incapable of bringing about any change in the mode of a paramanu."

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23. Bhagwati Sutra 3-3.

The Maximum Velocity of a Paramanu

The maximum velocity of a single unattached 'paramanu' is very high.[24] In a single instant or time-point 'samaya', it can travel from the end of the easternmost part of this universe measuring 14 Rajjus, to the end of the westernmost part; from the end of the northernmost part to the end of the southernmost part; from the end of the northernmost part to the end of the uppermost part. In order to comprehend how great this velocity is, we have to explain the technical words used in the 'Agamas'. 'Samaya' is a peculiar word in Jain phraseology. It is the infinitesimal and indivisible unit of time or time-point just as a 'parmanu' is the indivisible unit of matter. We can understand this roughly thus: in a single twinkling of our eye countless number of time-points have elapsed. In that short space of time a 'paramanu' travels from the nethermost end of the universe to the topmost end. From the use of the word universe, it may be imagined how great is the speed of a 'paramanu'.

Let us elaborate this point. According to Jain canons this whole universe from top to bottom measures 14 Rajjus. How large is a Rajju is gathered from the description in later books which is as follows:[25]

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24. Bhagwati Sutra. S. 16. U. 8.
25. Von Glassnapp in "Der Jainisms".

"Rajju is the distance which a Deva flies in six months at the rate of 20,57,152 YOJANS in one 'KSHANA' i.e. (instant of time).

Other Principles regarding Motion

There are certain other rules also governing the motions of a 'paramanu'. If undisturbed and left to itself the motion of a 'paramanu' is in a straight line. A change in the straightline motion occurs only if it is reacted upon by some other matter. A 'Jeeva' can never be a direct cause in the change of motion of a 'paramanu' because it is infinitesimally minute. A 'Jeeva' can influence directly big or small aggregates only. Just as the maximum velocity of paramanu has been described in Jain scriptures so also is its minimum velocity. A paramanu moving with its minimum velocity can in a single time-point move from one space-point (pradesh) to an adjoining one. A space-point is as infinitesimal as a 'paramanu'. As said before, a paramanu may move spontaneously or when activated by other matter.[26] There is an indeterminacy as to when an inert paramanu at rest, will activate. But after the lapse of a countless number of time-points, it must activate. Similarly there is also an element of caprice as to when an active or mobile paramanu will come to rest or become inert. It can do so in one time-point up to a small fraction of an avlika[27] (a small measure of time, less

26. Of Heismberg's "Principle of Uncertainty."
27. One Avlika—48|16777216 minute.

than a second). But after the lapse of the above-mentioned time it is sure to come to rest or become inert.

Nothing can stop the motion of a 'paramanu'. It can penetrate and pass through the thickest iron wall in its natural course. A mountain cannot stop it. It can pass through the strongest electric field. There is only one thing that can affect the motion of a paramanu —a headlong collision of two fast moving paramanus —and then both of them will be mtually affected.

Microstatics or Occupation of Space by Paramanus

A very astonishing property of a Paramanu is its capacity to occupy the same space-point which is also occupied by another Paramanu or by an aggregate of infinite number of 'Paramanus. This is due to the amazing microspatial property of the Paramanu to occupy space. Acharya Pujyapad, the author of the work 'Sarvartha-siddhi' has raised a question on this and has himself given a beautiful solution. He questions.[28] "How can this universe consisting of countless and not infinite space-points be the container of the aggregates consisting of infinite number of paramanus?" The answer given by him is: "Due to the amazing property of 'infinite compressibility of the micro-matter', aggregates consisting of infinite 'Paramanus', may occupy only a single space-

28. According to Jain mathmeatics 'infinite' is much greater than 'Countless.'

point." Thus there is no inconsistency and no problem.

Divisions and Subdivisions of Pudgala (matter):

To facilitate study of matter, aggregates of matter are divided into various divisions from different points of view. These classifications have been made in a very scientific manner.

SIX DIVISIONS: All aggregates of matter can be divided into six kinds:[29]

(1) very gross, (2) gross, (3) fine-gross, (4) gross-fine, (5) fine and (6) very fine.

Kundkundacharya, has, in his book Niyamsara illustrated these six divisions thus:

(1) Large aggregates of matter which may be broken and cut and can be carried physically (solids), e.g. land, stone, mountain etc.

(2) Large aggregates of matter which cannot be cut or broken but can be physically carried (liquids) e.g. ghee, water, oil etc.

(3) Aggregates of matter which can neither be cut or broken nor physically moved but are visible to the eye, e.g. shadow, heat etc.

(4) Aggregates of matter which are not seen by the eye but can be felt by the other four senses (ultra

29. (a) Niyamsar—21.
(b) Gomatsar Jeeva Kand Gatha 602.

visible but infra sensual matter) e.g. air and other gases.

(5) Aggregates which are not perceptible by the senses (sukshma), e.g. matter necessary for thought and speech etc.

(6) Aggregates which are finer than the thought-matter or speech-matter, e.g. aggregates having two 'pradeshas.'

Three Divisions.

Matter has been divided into three divisions based on the mutual resultant mixture of matter and soul.[30]
(1) Prayoga Parinati: Those aggregates of matter which have been assimilated by and are combined with soul, e.g. senses, body, blood and flesh etc.
(2) Mishra Parinati: Aggregates of matter which were assimilated by the soul but released again—e.g. nails and hair, after being cut, urine, stool and phlegm etc.
(3) Vishrasa Parinati—Those aggregates of matter which have nothing to do with soul and are formed independently, such as clouds, rainbow etc.

Sound, Shade, Light also are Pudgala (material).*

Jain Philosophy propounds some classes of matter which were not accepted as matter by ancient philosophers. But many of these have now been accepted to be *matter* by modern science. These are sound, darkness, shade, sun light and brightness etc.[31]

30. Bhagwati Shatak 8|1|1.
31. Shri Jain Sidhant Dipika. P. 1.

Sound is an attribute of certain kinds of material aggregates. It is not non-material because it is subject of the sense of hearing viz. the ear. Whatever can be perceived by the senses must be material (Pudgala). Sound is of two kinds, Prayogik (forced) for which an effort is required, and Vaisrasika—(natural or spontaneous) for which no effort is made. Prayogik is again of two kinds: linguistic and non-linguistic.

Linguistic is that which has a literal meaning.

Non-linguistic is that sound which does not represent any language.

It is of four kinds viz.

Tat—the sound of a drum etc.

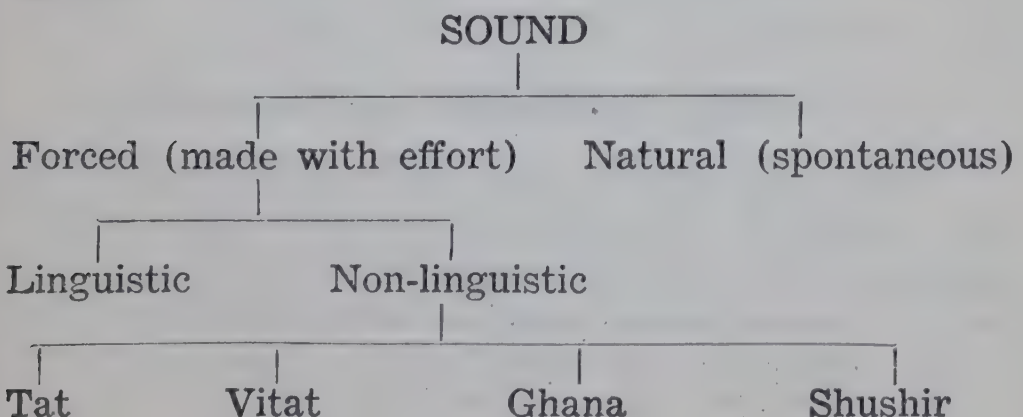
Vitat—the sound of a violin etc.

Ghana—the sound of a bell etc.

Sushir—the sound of a flute etc.

Vaisrasika or spontaneous sound is the natural sound produced by Thunder etc.

The following chart gives the different kinds of sound:



Some classify sound into three classes i.e. that produced by (1) animate things, (2) inanimate things (3) mixed effort of animate and inanimate things.

With reference to the velocity of sound, the writers of scriptures have said that, sound produced by a great impact may reach the other end of the universe within a few instants.[32]

Darkness and Light

Darkness is the result of a combination of large number of black pudgalas. Hot light from incandescent objects, e.g. sun, lamp, is 'Atap'. Reflection from a mirror etc. is 'Chhaya'. The cold reflected light, e.g. from the moon is 'Udyot' and the accumulation of the reflected light by brilliant stones is called 'Prabha' (brilliance). Although the ancient sages have made several divisions such as 'Udyot', 'Atap' etc. of (pudgala) waves of matter, yet we can broadly classify them into two main subdivisions; light and darkness. 'Udyot', 'Atap', 'Prabha' etc. are all but the different aspects of light, while shadows etc. may come under the category of darkness.

Formation, Destruction and Continuity

Jain Philosophers have said that substance is that which is possessed of qualities and modes.[33] Quality is the inherent property of a substance. Its

32. Pannavana Pad Bhasha. 11.
33. Utradhyan Sutra Adhyan 28-6.

relation is with its existence. It was, is, and will remain in it (substance). The instantaneous change in a substance is its mode and there is a constant change in every substance at every instant. An old mode is destroyed and a new mode is formed. Therefore, the preceptors have defined substancee as[34] "A substance" (or reality) is that which persists through modes. It, is as well as becomes." A substance by its very nature possesses the trio: formation, destruction and continuity or persistence. Here formation and decay are its modes and continuity is its quality. In Panchastikayasara both the above definitions are given. Just as when an ornament of gold is broken and a new ornament of different kind is prepared from that gold, the inherent quality of goldhood is persistent in both, there gold is continuous. While the destruction of old form and formation of a new shape are respectively decay and formation.

Dynamic Nature of Matter: The component basic element of the visible universe is 'Paramanu'. All the different kinds of things (in the universe) are the result of the combination of the 'Paramanus'. In all these different kinds of things, formation and decay is going on at every instant and yet the 'paramanu' itself is eternal and continues to persist. Not a single new 'paramanu' is produced nor is it destroyed. They are the eternal denizens of this ever changing universe. When wood is burnt some substance changes

34. Tattvartha Sutra 5-29.

to charcoal, some to ash and some to smoke and gases. But 'paramanus' persist in all of them. First they were in the form of wood and now they are in various different forms. The gross or external change in a thing is circumstantial. But the subtle or inherent change is going on at every instant. A wood is burnt and changed into gases and ashes. This is a gross change. But even when that wood is stored in a well protected place, a change is taking place in that at every instant. That change is not directly visible to the naked eyes. But when that very wood after a long space of time is decayed and becomes part of the earth (in the form of coal), the change is visible to the mortal eyes. And we easily understand and accept that in that thing (the wood) change, in the form of decay of the old mode and formation of a new mode was continuing all the time. That wood could not have changed from its previous form (wood) into its new form (coal) in a single moment.

How and why does this change take place? Even from the densest of things like iron or lead, at every instant, countless 'paramanus' are shed and new 'paramanus' or minute aggregates thereof, are entering it. The apparent staticity of the outward appearance of a hard substance does not reveal what is really going on in the interior. In reality there is a continuous commotion and dancing about of 'paramanus'. It has been said in 'Jeeva Kanda' of 'Gommatsara' also that in a pudgala (material) substance,

numerous, countless and infinite 'paramanus' are in constant commotion.

The Shapes or Forms of the Matter

Shape or form are called 'samsthana'. These can be divided into two classes, viz., regular and irregular or symmatrical and assymetrical. Aklankadeva in his 'Rajvartik' has called these two words as 'Itham' and 'Anitham'. Regular shapes are those which are of specified geometrical forms e.g. triangle, square, circle, parallelogram etc. Except these, all shapes which have no specified form are called irregular e.g. the forms of clouds etc.

Methods of Dividing or Splitting Matter

Material objects can be divided or split in five different ways viz. bursting, grinding, breaking, removing of layers and fissure.

(1) Bursting e.g. that of a ripe sheaf of pea.
(2) Grinding e.g. making flour from wheat.
(3) Breaking e.g. making pieces of stones.
(4) Removing the layer e.g. from mica.
(5) Fissure e.g. those found in a dried pond.

Four Qualities of Matter

All material objects have four qualities viz. touch, taste, smell and colour. In the Bhagwati Sutra this has been very clearly stated. There, it is said that Matter has five colours, five tastes, two smells and eight touches. According to the Jain

Canons there are five colours: blue, yellow, white, black and red; five tastes; bitter, sour, sweet, pungent and astringent (kashaya); two smells: pleasant and unpleasant; eight touches: soft, hard, heavy, light, cold, hot, adhesive and dry. In a single 'paramanu', there is one colour, one smell, one taste and two touches. But in a large or gross aggregate of matter there are all the five colours, the five tastes, the two smells and the eight kinds of touches. From the stand-point of touch-data, there are two kinds of aggregates—these having four touches and those having eight touches. The finest aggregates of matter are possessed of four touches only. In such aggregates, the following four out of the above eight will be found, viz., cold, hot, adhesive and dry. It may even be said after deep consideration, that these four kinds of touches are the only original or fundamental touches of matter. In a 'paramanu' only two out of these four will be found i.e. a 'paramanu' will be either cold or hot and adhesive or dry. In a single paramanu none of the following four touches viz. soft, hard, heavy and light is to be found. The conclusion is, that these four kinds of touches are not original but are acquired touches. No rules governing the change and growth of these touches are available, though there must be some such rules, or else how was it that some aggregates formed by the combination of infinite number of 'paramanus' are found to possess only four kinds of touches and some become possess-

ed of eight kinds of touches? It is noteworthy that Jain Philosophers have not accepted heaviness and lightness i.e. mass, as an original or primary property of matter. These also are the results of the acquired properties of the combination of different 'paramanus'. It is a subject of great importance for research work—that while being transformed from gross aggregates to fine ones the matter loses its mass etc. and while being transformed from the fine to the gross the qualities of weight etc., are acquired. Much has been known about natural phenomenon such as lightning, meteors and rainbows in the modern science. Concise but important data is also available in the Jain Philosophical literature. The combination of paramanus into aggregates is termed as 'Bandha'. This is of two main kinds—natural and artificial or synthetic. Synthetic association is the result of an effort by an agent and has, therefore, an origin with respect to time. Natural association does not envisage the effort of an animate agent. These may or may not have any origin with respect to time. Associations which have an origin are those which are formed and destroyed and reformed, but all, without any human or animate agency. Lightning, meteors and rainbows are instances of such associations.

Answering the question: "How is the lightening caused?", it is said that the properties of adhesiveness and dryness of the 'paramanus' are the

main causes of lightning. What are meteors? On this subject modern scientists have written a number of treatises and have put forth various theories. According to Jain conception, meteors are not the result of the breaking up of stars, nor are they resultant pieces of two mutually colliding celestial bodies. But they are the results of friction between aggregates of various nature in the space which is full of them. Similarly, the association and combination of various 'paramanus' results in clouds and rainbow etc.

ATOM IN MODERN SCIENCE

It is undisputedly accepted in scientific circles that the concept of 'Atom' was propounded by the Greeks. Democritus was the first man in the world to say that, "This universe is an entity formed by the void space and the invisible, indivisible infinite number of 'atoms'. Everything visible or indivisible is the result of the association or dissociation of 'atoms'."[35] Democritus was a famous Greek Philosopher, who was born in 460 B.C. and died in 370 B.C. His views about Atoms may be summarised as follows:[36]

(i) Matter does not pervade this world as an entity, but is divided (discrete).

(ii) All material bodies are composed of solid

35. Cosmology old and new P. 6.

36. Comprehensive Treatise on Inorganic and Theoritical Chemistry.

'atoms'. The 'atoms' are different from the space and each 'atom' is a separate independent unit.

(iii) 'Atom is indivisible, indestructible and impenetrable. It is complete in itself and is eternally new or fresh.

(iv) There is difference of geometrical shape, length, breadth and weight between different 'atoms'.

(v) The number of types of 'atoms' is limited, but there are infinite number of 'atoms' of each type.

(vi) The qualities of aggregates depend on the nature and mode of combination i.e. which type of 'atoms' are combined in what manner.

Thus, for example, the 'atoms' of hydrogen were considered as being nearly spherical, where those of oxygen were considered to have the shape of a doughnut.

(vii) 'Atoms' are dynamic by nature and never at rest.

From the time of Democritus and up to the 19th Century, various investigations (researches) were going on regarding the Atomic Theory and new facts were revealed from time to time. But till then, the

atom remained indivisible, impenetrable and infinitesimal.

The Minuteness of the Atom: How minute is the so-called 'atom'? An inference can be made about its minuteness from the fact that 50 shankhas (quatrillions) of 'atoms' weigh only about 2-1|2 tolas. Its diameter is only a billionth part of an inch. If 'atoms' were placed side by side in juxtaposition, over a lakh of them would be required to make up the thickness of a thin wrapper paper of a cigarette or a kite. In a small grain of sand there are more than 10 trillion atoms. When sodawater is poured in a glass, small bubbles come out of the water. If, in order to count the number of 'atoms' in one such bubble, three thousand million men were employed and if they went on counting the 'atoms' continuously without rest, day and night, and without taking any food or drink, counting at the rate of three hundred per minute, it will take them four months to finish the job of counting the 'atoms' in that one tiny bubble.

While pulling a fine hair, a tiny drop of blood is found at the root of the hair. If, by means of a powerful microscope, that drop could be magnified so that its diameter is six or seven feet, even then an 'atom' therein would have a diameter of 1|1000 of an inch.

From Five to Ninety-two Elements: A jar is made of clay. The jar as a whole or a broken piece of it will

surely be found to be composed of clay. Even after a change of shape whatever substance is found to be common in all shapes is called the "material cause". Clay is, therefore, the material cause of jar. What is the 'material cause' of the innumerable varieties of substances which fill the visible universe? It seems that speculation on questions like this led to the theory of 'Five Elements'. In India also some sages opined that 'Earth' which was the material cause of most of the substances is produced from 'Water' and 'Water' is produced from 'fire' and 'fire' from 'air' Some considered 'water' as the original cause. They considered 'space' to have been produced from the 'soul'. In Greece, Thales (a contemporary of Charvak) held that 'water' was the main cause of this Universe. His disciple Anaximens held 'air' as the primary cause; and Herecluntes proved that 'fire' was the primary cause. Thus, from the sevent or eighth century B.C. to seventeenth century A.D., four or five elements held the field of primary cause.

The agnostics of India considered 'space' also as an element, but when they could not prove the same by reasoning they gave up that idea. They remained the followers of the 'Four Elements' only. This theory of considering the 'Four Elements' as the primary material cause of the universe came to an end when early chemists made great but futile attempts to transform iron or copper into gold. At first Boyle wrote a book called the 'Suspicious Chemistry' and

doubted the 'Theory of the Elements' as the primary cause, which was current from the time of Thales. His belief was that these five elements are not primary even. The primary elements are different from these, and they were the result of the combination of such elements. Up to that time, air was not considered to possess mass. It was Boyle, who, for the first tim proved, that air also has mass. Up to that time 'air' was mostly recognised as a priramy element. Though various kinds of gases were discovered, they were considered as being different modes of 'air'.

In 1755, Blank, an Englishman, for the first time, discovered carbondioxide. He named it as 'fixed air'. Priestley (1774) discovered oxygen, one of the present day primary chemical elements, and showed that it is essential for lighting fire and for the breathing of living beings. Hendry Cavendish proved that water was a combination of oxygen and hydrogen. The conception that water is a primary element was removed from that time. A molecule or the smallest particle of water is formed by the combination of two atoms of hydrogen and one atom of oxygen. Works of Greek scholars were looked upon with great reverence in Europe, until the results of new researches began to appear in the field of physical science. Galileo, Newton and Boyle held great respect for the Atomic Theory of Democritus. John Dalton for the first time clearly demonstrated

the difference between the elementary and the composite substances. He proved that composite substances are formed by the combination of one or more primary elements. An element is not a composite substance. He also proved that there are differences in the atomic weights of different elements, and that, if elements are made to combine in the same proportion, the result will always be the same. Thus the door for researches for the discovery of primary elements was opened and with the beginning of the nineteenth century, their number came up to thirty.

In the course of these studies, as the hydrogen atom was found to be the smallest of all, it was at first considered that it alone was the elementary particle. But this theory could not last long. When hydrogen atom was more accurately weighed, it was clear that it cannot be the primary ingredient of all other elements. The accepted definition of an element then was: "A substance which is not the the result of any mixture and which is composed of elementary 'atoms' of a definite character." By now the number of elements gradually increased from the original five and has reached to 92. These 92 elements are as follows:

1. Hydrogen.
2. Helium.
3. Lithium.
4. Verilium.
5. Boron.
6. Carbon.
7. Nitrogen.
8. Oxygen.

9. Flaorine.
10. Neon.
11. Sodium.
12. Magnesium.
13. Almunium.
14. Silicon.
15. Phosphorus.
16. Sulpher.
17. Chlorine.
18. Argon.
19. Potassium.
20. Calcium.
21. Scandium.
22. Titanium.
23. Vinadium.
24. Chromium.
25. Manganese.
26. Iron.
27. Cobalt.
28. Nical.
29. Copper.
30. Zinc.
31. Galium.
32. Germenium.
33. Arsanic.
34. Sclenium.
35. Bromine.
36. Krypton.
37. Rubidium.
38. Strantium.
39. Yetrium.
40. Zerconium.
41. Neubium.
42. Molebdium.
43. Masurium.
44. Ruthanium.
45. Rahodium.
46. Polladium.
47. Silver.
48. Cadmium.
49. Indium.
50. Tin.
51. Antimony.
52. Tillirium.
53. Iodine.
54. Kasenum.
55. Sesium.
56. Barium.
57. Lanthaum.
58. Scrium.
59. Prosidium.
60. Neodimeum.
61. Illinium.
62. Samerium.
63. Eropium.
64. Gadnium.
65. Tarbium.
66. Disprosium.
67. Holmium.
68. Arbium.

69. Thulium.
70. Utrabium.
71. Lutansium.
72. Hafnium.
73. Tantlum.
74. Tungsten.
75. Rahanium.
76. Osmium.
77 Heridium.
78. Platinum.
79. Gold.
80. Mercurry.
81. Thalium.
82. Lead.
83. Bismuth.
84. Pulomium.
85. Astanum.
86. Radon.
87. Francium.
88. Radium.
89. Octinium.
90. Thorium.
91. Protooctinium.
92. Uranium.

FORMATION OF PRIMARY ELEMENTS: Up to 1811, a molecule was considered to be the minutest indivisible elementary body, because it was believed up to that time that the elementary substances like gold, silver, iron etc. cannot be transformed into another. A molecule of gold, silver etc., was considered to be the primary or elementary particle. The famous scientist 'Avogadro' differentiated a molecule from an atom. For 86 years after that, the atom was considered to be the indivisible elementary particle. The honour of making the first incision in the complicated operation of dissecting the delicate body of the atom belongs to the famous British Physicist, Sir J. J. Thomson, who in 1897, in the course of experiments, discovered a tiny particle which was very much smaller than the atom of hydrogen. This mysterious particle changed the whole conception about atomic

structure. As a result of several experiments it was established that the 'atom', which was considered to be a solid indivisible and simple elementary body, was in fact a complex mechanism with moving parts and lot of hollow space. However, it was Rutherford, a disciple of Thomson, who after many important and famous experiments established the nuclear structure of the 'atom' and he is therefore called the 'Father of Nuclear Physics'. The small particles proved to be important portions of atoms and are called electrons. After understanding the new forms of 'Paramanu', the primary elements like Gold and Silver etc., appear before us in a new shape.

THE PRESENT SHAPE OF PARAMANU: The atoms, themselves, which were considered so far as elementary particles, were proved to represent rather complicated miniature solar systems. Every paramanu represents a number of particles. Some are embeded in its nucleus, while others constantly rotate within its cells at a high velocity, just as the planets,saturn, mercury, mars, venus etc., rotate round the Sun. In the solar system, the distance between the electrons (planets) and the nucleus (sun) is several thousand times the diameter of the electrons. Both the Nucleus and the Electrons are thousands of times smaller than the 'atom' itself. Electrons are negatively charged while nucleus contains positively charged particles. In each of the 92 elements there is a different number of electrons from 1 to 92. Thus

the atom of the first has 1 electron, that of the second two, and so on, upto the atom of 92nd element which has 92 electrons.

Hydrogen Atom

Hydrogen is the first of the 92 elements. It is a gas and was first discovered in 1756 by Cavendish as a distinct substance. Its 'atom' is the lightest of all. In the first part of the 19th century it was considered to be the primary particle of all the elements; but later this was proved to be false. At present it is accepted to be an independent element—the first of the 92 elements. The internal structure of hydrogen atom reveals that there is a single positively charged particle called 'proton' as nucleus, and a single negatively charged electron, rotating about it. Thus, these two oppositely charged electric particles make up a hydrogen atom. But since the positive charge of the nucleus is equal to the negative charge of the electron, the hydrogen atom as a whole is electrically neutral. This is also the case with all the atoms of different elements—the number of electrons being equal to the number of positively charged particles (protons) in its nucleus. The size and weight of all these have now been accurately determined and are given below:

A hydrogen atom has a diameter of 1|200,000,000 inch and its weight is 164|000,000,000,000,000,000,-000,000 gramme.

The nature of the positive and negative particles of a hydrogen atom is as follows:

Electron has a diameter of 1|5,000,000,000,000 inch; a speed of 1,300 miles per second and its weight is 1|2,000 part of a hydrogen atom.

Proton has a diameter nearly 10 times that of an electron and its weight is equal to 164|1,000,000,000,-000,000,000,000,000 gramme.

The description of the hydrogen atom can be summarised thus: It has a single proton as nucleus; a single electron rotates round it at a speed of 1300 miles per second; practically the whole mass is concentrated in the nucleus and its diameter is only 2 billionth part of an inch. It is astonishing but true that a major part of the 'atom' is empty space. If we imagine a 'proton' to assume the size of an amla-fruit (i.e. about an inch in diameter), the empty space between the orbit of the electron and proton would be 666 yards and 2 feet.

OTHER ATOMS: In the atomic table, after hydrogen, comes Helium. Its nucleus has two protons. Two electrons are constantly rotating round the nucleus. In the same way there is a consistent increase of one electron in each element in the sequence. Thus, the third element Lithium and the fourth Beryllium have 3 and 4 protons and electrons respectively; and so on up to the last and the heaviest natural element 'Uranium'; in the

nucleus of which there are 92 protons, and an equal number of electrons are rotating round its centre. As there is only one electron in a hydrogen atom, there is only one orbit in which it rotates. In the other atoms all the protons unite together and form the central nucleus, but the electrons form different groups and rotate in different but well defined orbits.

There is, however, one important fact to be borne in mind, viz., the nucleus of an 'atom' contains some other particles besides protons. Consider, for example, the nucleus of an oxygen atom. Since oxygen is the eighth element in the natural sequence, its atom must contain 8 electrons and its nucleus must carry 8 positive charges. But oxygen atoms are 16 times heavier than those of hydrogen. Thus, if we assume that an oxygen nucleus is formed from 8 protons, we would get a correct charge, but a wrong mass (both 8); and assuming 16 protons we get correct mass, but wrong charge (both 16).

Neutrons And Positron

It is clear, therefore, that some of the particles forming complex atomic nuclei are electrically neutral, but have the same mass as a proton. The existence of such chargeless protons or neutrons as they are now called, was suggested by Rutherford as early as 1920; but it was twelve years later in 1932 that they were discovered experimentally by Chadwick, an assistant of Rutherford. The derivative

meaning of 'Neutron' is that it has neither the negative charge of an electron nor the positive charge of a proton. It must be particularly noted here that protons and neutrons should not be considered as two different kinds of particles but rather as two different electrical states of the same basic particle now known by the name of 'Neucleon'. In fact, it is known that protons can turn into neutrons by losing one positively charged particle, called 'positron' and neutrons can turn into protons by acquiring it. 'Positrons' are quite similar to ordinary electrons except in the sign of their charge and they actually do exist in nature, though not so plentifully as electrons. And, there is a possibility that 'negative protons' also exist, although experimental physics has not yet succeeded in detecting them. And now we have a complete list of elementary or basic particles known to the modern science representing the only necessary building units for the construction of any desired material substance.

A positive proton has a large mass and one unit of positive charge.

A neutron has a large mass, but no charge.

A negative proton (still to be discovered) has a large mass, but no charge.

An electron is a free unit charge of negative electricity.

A positron is a free unit charge of positive electricity.

Let us pause at this point for a moment, and ask: 'Is any of the above particles the ultimate indivisible unit of matter?' The modern physicist or chemist, in his search for the basic or elementary particle of the structure of universe, has played first with the molecules, then with the atoms and now he is toying with the electrons and the nucleons. But he dare not state that he has reached the ultimate; that nucleons etc., are really elementary and cannot be subdivided into smaller constituent parts. Wasn't it assumed only half a century ago that the atoms were indivisible? Yet, what a complicated picture they present today! May be, there are 'solar systems' in the heart of the Protons etc.

Radio Activity and the Transformation of Elements

Discussion about the radioactive elements is now going on from one end of the world to the other. How, by the tests of the Hydrogen Bombs carried out by the Americans and the Russians, radioactive particles are scattered in the sky and carried thousands of miles away and what is their destructive effect on mankind, is now the burning topic of the day. To understand radioactivity is not wicked. It is a property of matter and is spontaneously revealed in this vast field of nature by some rare substances. It is a very good illustration of the mysterious nature of 'Pudgala' (matter). Uranium, radium and other elements having 83 to 92 electrons

are naturally radioactive, while hydrogen bombs and atom bombs are typical examples of producing radioactivity artificially. The process of radioactivity consists of the emission of an electron or proton, (the constituent elements of atom), either spontaneously or by artificial methods, with or without the accompaniment of sound like that of the explosion of a bomb. Sometimes, radio active material is diffused in large areas. This diffusion is called 'radiation'.

Uranium which is the last of the 92 natural elements emits 3 kinds of radiations. They are named as 'alpha', 'beta' and 'gamma' rays respectively. When an atom of uranium has lost three alpha particles, it is transformed into an atom of Radium, which itself is a radioactive element. It also emits all three kinds of radiations constantly. When it loses five alpha particles, it does not remain radium but is changed into lead. All the three radiations, 'alpha', 'beta' and 'gamma' rays are of different nature. 'Beta' particle is the same as an electron, but is emitted from the nucleus of anotom. 'Alpha' particle consists of two protons and two neutrons and is the same as atomic nucleus of Helium. 'Gamma' rays are similar to x-rays but much more powerful. The wave length of an x-ray is ten millionth part of an inch, while gamma rays have a wave length of a thousand millionth part of an inch. The effect of the above-mentioned variations from uranium is the reduction of the number of electrons and protons from uranium

atom, till they reach the same numbers as an atom of radium and thus, uranium is changed into radium. When again, their numbers are further reduced, the astonishing substance called radium is transformed into ordinary lead. This transformation can also be brought about in some other elements in the laboratories. In 1941, a scientist, Benjamin changed mercury into gold. The atomic weight of mercury is 200. It was exploded with proton which was absorbed in the nucleus of the atom of mercury and its weight became 201. But this product was electrically unstable. Eventually the nucleus emitted an alpha particle, the weight of which was 4. The result was, that the weight of the nucleus was now changed from 201 to 197, which is the atomic weight of gold.

In 1953, experiments to change platinum into gold were successfully carried out in many laboratories. The point, as to which element can easily or with difficulty be changed into which other element, may not have been fully experimented upon by the scientists; but in the field of science the change of one element into another is no longer a question of imagination only.

The Three Stages of a Substance

Every 'atom' is built-up of positively and negatively charged particles. The negative particle repulses any other particle approaching it.

On the basis of this, in every substance there is swelling. In the most solid of substances there is more empty space than matter. If all the atoms in a big elephant were compressed in such a way, that there was no empty space in between the atoms, the elephant would be so minute that it may easily pass through the thread hole of a needle. According to the difference of empty space of the construction of substances, they have three stages: solid, liquid and gaseous. This large amount of empty space can be attirbuted to the repulsive forces between the different electrical charges.We can, as well say, that every substance may assume any one of all the three stages, viz., solid, liquid, or gaseous. But it is certain, that in whichever of the three stages a substance may be, the atoms in it are always in motion. In gaseous stage, this movement assumes the form of wild commotion and the molecules prance about jostling one another. It has been estimated that an atom in a gas will be pushed about by the other atoms, a thousand million times in a second, when the distance between them is only three millionth part of an inch.

Matter and Energy

Some time ago it was believed that energy was an independent separate entity like matter. But Einstein has proved, beyond doubt, that energy and matter are not different from one another. In fact, matter can be transformed into energy and vice

versa. This is a revolutionary discovery of Einstein in the field of science. Heat, light, electricity and magnetism are some of the visible forms of energy.

HEAT: We have seen that electrons move within the atom; atoms move within the molecules and the molecules themselves, are also in constant motion in all states of matter. This motion of molecules is known as heat or thermal motion and is responsible for the phenomenon of heat.

If we heat a substance, the molecular motion becomes more violent, while with cooling, the intensity of the motion subsides. What we usually call temperature is nothing else but a measurement of the degree of molecular agitation.

It has been established that at a temperature of 273 degrees C or 459 degrees F, thermal agitation of matter completely ceases and all its molecules come to rest. This temperature is, therefore, known as absolute zero. All substances are frozen solid at 'Absolute zero'. Hydrogen, oxygen and nitrogen are solid below 259 degrees C, and 218 degrees C and 209 degrees C respectively. Above these temperature they melt and become liquid and at still higher temperatures they boil and become gaseous. Frozen water (ice) melts only at 0 degree C. Leads melts at +327 degrees C, iron at +1535 degrees C and osmium remains solid upto + 2700 degrees C. In the same way water boils at 100 degrees C while lead boils at + 1620

degrees C, iron at + 3000 degrees C and osmium at + 5300 degrees C.

LIGHT: Light always has velocity. Light, whether from a tiny lamp or from the sun is propagated in all directions from its source at the rate of 1,86,000 miles per second. This is such an unchanging constant velocity that modern scientists have adopted it as a unit to measure the velocities of, and the distances between celestial bodies, moving rapidly in cosmic space. Sometimes before, it was believed that light is weightless, but now it has been established that though it is electro-magnetic in character, it does possess weight. In fact, it is known that the weight of sun light falling on a square mile per minute is 2-1/2 tolas.

ELECTRICITY: There are two kinds of electric charges—positive and negative. The unit of the former is a proton and that of the latter an electron. Every material body in this world has, therefore, an electrical origin, for all matter is composed of atoms which in turn are composed of electrical particles. The lightening which is produced by the friction of clouds is not different in character to this electricity. Modern science knows innumerable ways of generating and controlling electricity and it has become a thing of every day use for the human race.

Atom Bomb and Hydrogen Bomb

Atom bomb and Hydrogen bomb are also astonishing results of the primordial forces of

matter. Half a century ago, it was believed that the atom is indivisible. By and by, as the radio-activity of certain elements, which transform themselves by natural distintegration came to light, it was presumed that it is possible to disintegrate the atom. In course of time it became known that the nuclei of various elements are loaded with tremendous amount of internal energy that can be liberated by the processes of nuclear fission of heavier elements and nuclear fusion in case of lighter ones. Tremendous efforts of scientists in this direction created the Atom bomb. Uranium is the only natural element used so far for making a fission-type Atom bomb. There is another element called Plutonium (Pu-239), but this is not a natural element. It is an artificial man-made element with atomic number 94.[37] Uranium being naturally radio-active, nuclear fission of its atoms has been comparatively easy. Uranium has several isotopes, but the two best known of them are U-238 and the famous U-235. The latter is the only easily fissionable substance. It does not exist in nature in a pure form, but is always diluted by the heavier unfissionable U-238 (.7% of U-235 and 99.3% of U-238). Pure U-235 must be separated from U-238 to make an Atom bomb.

A Hydrogen-bomb is, on the other hand, a fusion type bomb. In this case the nuclei of hydrogen are fus-

37. It should be remembered that only a small fraction of the mass is transformed into energy.

ed together to create those of Helium and during the process of fusion, tremendous amount of internal energy is liberated. We know that Hydrogen and Helium are the first and second elements in the atomic table respectively and an atom of the latter is four times heavier than that of the former. Most careful measurements have, however, shown that there is a slight loss of matter (mass) during the process of fusion of 4 hydrogen nuclei into one Helium nucleus, and this matter is actually transformed into energy. If this liberated energy could be collected in the form of heat, each nuclear fusion will liberate heat equivalent to the combustion of 2700 maunds of coal. Hydrogen bomb is the device for concentrating this tremendous heat-energy in a small area and liberating it instantaneously.

This liberation of energy during fusion was known even earlier than the nuclear fission. But it was also known that temperatures of the order of tens of thousand-million degrees were necessary to bring about the fusion of 4 hydrogen nuclei into one of Helium, while the cleverest scientist succeeded to obtain less than even a hundred-thousand degrees. The nuclear fission of U-235, however, was accompanied with very high temperatures which made the fusion of the Hydrogen nuclei possible. The result was that the fission bomb acted as a match-stick for the successful explosion of the Hydrogen bomb. Alas! how true it is that one vice gives birth to another—a

bigger one. If there was no fission bomb the Hydrogen bomb would not have come into existence. But we are digressing from our theme—we only wanted to study and emphasise the astonishing properties of matter proved by science—the fusion and the fission or "Pud" and "Gala" which fully justified the name 'PUD-GALA' given to it by the Jain thinkers.

Comparison And Conclusion

We have now discussed micro-cosmology in great details and with authoritative quotations both from Philosophical and Scientific stand-points. It will not be easy for a common man to grasp the gists of both and to make a critical comparison of them. Hence we shall, in the following paragraphs, present a brief comparative study of the outstanding features of the subject in Philosophy and Science.

Lord Mahavira's definition of 'Paramanu' is: "The basic or elementary unit of matter is indivisible, unfissionable, impenetrable, incombustible and imperceptible." That is, it cannot be split by any means or weapons, whatsoever. Even the greatest electrical force cannot split it; the sharpest weapon cannot divide it into two; it can rest on the sharpest edg of a sharp weapon; a 'paramanu,' resting on the edge of a sword or a razor, cannot be divided; it will not be burnt by the hottest centre of a fire; it will not become wet, even if it enters the 'pushkaravarta mahamegha'—the cloud, which can bring deluge on

the earth by incessant rains; it will not be destroyed, even if it enters the speedily moving opposite current of the Ganges or the Niagara falls; it will not lose its existence or identity even if it enters a drop of water or a whirl-pool of water. Again, 'Paramanu' of 'pudgala' has no half-portion; it has no middle portion; it has no pradeshas. It has no length, no breadth, no depth it is dimensionless. It always exists as a unit."

Democritus says "An atom is indivisible, unfissionable and indestructible. It is complete in itself and is eternally as fresh or new as it was in the beginning of the Universe." The so-called indivisible 'atom' of Democritus has already been split today, but the 'paramanu' of Jainology still remains indivisible and will ever remain so. According to Jain Canons it can neither be a subject of sensuous cognition nor experimentation. As has been said before, regarding its truly infinitesimal minuteness, "animate bodies (including human beings) cannot effect the motion or action of a 'paramanu'; they can effect only those material bodies which comprise infinite number of 'paramanus.' "

We, therefore, come to the conclusion that the 'atom' which was believed to be the indivisible unit of matter by science was in fact an aggregate of matter containing many 'paramanus' of Jainology. And today, it has been proved by actual experiments that the 'atom' far from being indivisible is really a

very complex mechanism with a number of different particles, a thousand times smaller than the 'atom' itself. First there were electrons and protons but as more progress was made it was established that even proton is not an elementary particle but consists of neutron and a positron. Electron is the smallest particle of all those discovered so far, but the scientists dare not pronounce even this as the ultimate or indivisible. And if they do, the chaces are that they will be proved wrong in the near future. According to the definition of Jainology an electron is not 'Paramanu' because it is subject to the actions and experiments of men. Electrons can now-a-days be plucked from here and attached there so easily. New artificial elements like the 92 natural ones, and their isotopes are created by increasing or decreasing the number of neutrons from the nucleus of atoms. Neutrons are used as bullets for splitting the nuclei. Sometimes they go right through the nucleus and sometimes they are caught there and become attached to the nuclei. e.g. when a neutron is caught by the nucleus of uranium its weight becomes 239 from 238. Such actions have resulted in the production of Neptunium and Plutonium, 93rd and 94th artificial chemical elements. According to the definition of Jainology none of these particles which are contained by an atom can be the ultimate indivisible or paramanu, but aggregates consisting of countless number or even infinite paramanus. It is a matter of presumption only that electron etc. are indivisible. Such a presumption

was made, till very recently, for an 'atom' also, but it proved to be false. Nature has not entirely revealed its mysteries to mankind. In future also whether nature is made to reveal further secrets by the hands of man, or not; it is impossible that man, with the limited power of his five senses, can reach that knowledge which the seers with the sixth sense or ultra-sensuous power have imparted to us.

Molecule vs. Skandha

'Skandhas' are the units of visible homogeneous material bodies. In other words it is obvious that all material bodies are the results of the union or combination of two or more, to infinite 'paramanus'. There is, however, an important correction to be made in this statement viz. that union of two or more 'Skandhas' or molecular bodies, may also result in a new body and the breaking up of a big body into smaller fractions also produces independent bodies.

Modern science has also discussed the molecular properties of matter at length. It is shown that "material bodies are made up of molecules which are constantly 'in motion'. In gaseous state, molecules are in a state of violent agitation moving around in all directions and pushing one another as though they were people in a highly excited crowd." In principle a molecule is explained thus:

"If a piece of chalk is broken into two and two into four and so on into countless minute grains, but each one still retaining all the properties of chalk."

The smallest such grain is a molecule of chalk. The point is that when any material body is repeatedly divided, a limit will be reached when further division will be impossible without losing the characteristic properties of that body. Therefore, the minutest grain of a body which retains the properties of that body is its molecule. Thus, there is some similarity and some contrast in the respective definitions of a molecule by Jainology and modern science. In Jainology an entity of material body is called a 'SKANDHA' e.g. a jar, a mat, a table, a pen, a book etc. If the jar is broken into two pieces, the result is two 'skandhas' and hundred pieces are hundred skandhas. If a piece of chalk is divided into two, we have two 'skandhas' and if into a thousand we have a thousand 'skandhas'. If it is ground to dust each grain of that dust is a 'skandha. According to science, the molecule is that minute part of grain which if further divided would lose all the properties of chalk and would be transformed into something altogether different. According to Jainology the molecult of Science is, of course, a 'skandha' but when further divided, it continues to be a 'skandha' (and all the other fragments too are skandhas) irrespective of its transformation from chalk, until each division results in 'paramanu'.

Formation of Material Bodies

A few simple rules which govern the union of 'paramanus into 'skandhas' of material bodies are

given in Jainology as follows:

"The reason why numerous 'paramanus' unite together to form a homogeneous body is the properties of adhesiveness and dryness possessed by them. Union between dry and dry or adhesive and adhesive 'paramanus' takes place provided the difference in the intensities of their dryness or adhesiveness is more than two units. No such proviso exists for the union of dry with adhesive 'paramanus'. 'Paramanus' with a single unit of intensity of dryness or adhesiveness never take part in any union."

Just as Jain Philosophers have given the dryness and adhesiveness as the sole cause of union, the scientists have shown that the positive and negative electric charges of material particles are responsible for uniting the constituent parts of the substances. According to Jainology each and every 'paramanu' possesses either dryness or adhesiveness and according to science positive and negative electric charges are existing in every substance. It appears, then that both Jain Philosophers and modern scientists state one and the same principle only in different words. One has preferred to call it adhesiveness and dryness while the others use the names positive and negative charge, but they both mean to describe the same primordial property of matter. Discussing the subject of lightening it is said in Sarvarthsi (Ch. 5—Sutra 34) that "lightning is the result of the properties of dryness and adhesiveness possessed by 'paramanus'." It is clear from this that positive or nega-

tive electricity is produced by the adhesiveness or dryness. It, therefore, comes to one and the same thing whether we name opposite electric charges as the cause of atomic union or dryness and its opposite. Besides this, further studies of various types of nuclear and atomic fusions amply prove the validity of the rules enunciated by Jain Philosophers. There is a prophecy about discovering 'heavy electron' in the scientific world. It is supposed to be 50 times heavier than a common electron;[38] and being an aggregate of negatively charged particles, is named Negatron. When such particles are[39] discovered, will they not prove the rule of the fusion of dry with dry? In the same way a proton illustrates the union of sticky with sticky and a neutron that of sticky with dry. In fact, in the whole structure of atom as revealed today, the cohesive forces, which can be attributed to the dryness or adhesiveness of the constituents, play an important part. In his book "Positive Science of ancient Hindus" published from London, Dr. B. L. Sheel says "Ancient Jain Philosophers know it very well that lightning is produced by the positive and negative electric charges."

Similarity of Velocities

In the microdynamics of the Jain Philosophy it

38. Science and Culture, November, 1937.

39. Actually these particles are now known as mesons. They are the unstable units observed in the cosmic rays and are identified to be the combinations of negative electron or positive electron (position) or both with the mysterious thieves of energy in the cosmic world called neutrinos.

has been stated that the minimum distance travelled by a 'paramanu' in one time-point is one space-point and the maximum in the same time is the length of the whole universe which is fourteen Rajjus. By fixing the minimum and the maximum it is automatically known that all other intermediate velocities are possessed by it in appropriate conditions. Modern Science has also revealed such astonishing velocities which cannot even be imagined by a common man.

An electron rotates in its orbit at 1300 miles per second.

The agitation of molecules in the gases is so violent that they collide with one another six million million times in a single second and the free path of each molecule between two successive collisions is about three millionth of an inch.

Light travels with a velocity of 1,86,000 miles per second.

Molecular speeds in very hard substances like diamonds is about 960 miles per hour.

There are points of similarity as well as contrast between micro-dynamics of Jainology and modern science. Modern science pronounces the electron as the smallest particle and its atomic trajectory is circular or elliptical. Jainology pronounces that the motion of a 'paramanu' is in a straight line unless acted upon by external forces.

Compressibility of Matter

Jainology states that a number of 'paramanus' may sometimes occupy a large space and the same number of 'paramanus' may be compressed densely and may occupy a fraction of that space. A general rule about this property and compressibility can be stated as under:

"A single free 'paramanu' can fully occupy its equivalent of space viz. one space-point; on the other hand their property of compressibility enables infinite 'paramanus' also to be contained by a single space-point simultaneously."

Science has not been able to reach the above stage of knowledge regarding the relation of space and matter, but highly dense substances have been recently discovered which support the statements of Jainology. Gold, mercury, lead and platinum etc. are commonly believed to be amongst the heaviest substances on earth. The difference between the weight of a cubic inch of wood and that of iron is well known. The sole reason for this, is the difference in density of matter. The amount of space occupied by a smaller number of wooden molecules and a large multiple of this number of metallic molecules is the same. Some celestial bodies are believed to be two thousand times more dense than platinum. In the words of a famous scientist "In some of these bodies (small stars) the matter has become so densely

packed that a cubic inch weigh a ton. The smallest star discovered recently is so[40] dense that a cubic inch of its material weighs 620 tons." Can anybody imagine that a small pebble falling from space can destroy a big building or, a giant crane will be unable to lift a tiny piece of one cubic inch?

According to Jainology, the minutest grain of sand contains or is composed of infinite 'paramanus'. It is a 'skandha'. The smallest 'skandha' is composed of two 'paramanus'. Every[41] visible material body, big or minute, is composed of infinite 'paramanus'. Division of 'skandha' will result in smaller 'skandhas' only. A single 'paramanu' cannot be detached from a 'skandha' by human hands. In other words, larger 'skandhas' will produce countless number of 'skandhas' on division. We come across such a discussion in Science also. Prof. Andrade has estimated that "If every man, woman, and child in the world were engaged to counting the number of molecules in an ounce of water and counted fast, say five a second, day and night, it would take about 4 million years to complete the job.[42]

According to Jainology air is also a visible substance and there are countless number of body

40. Ruby Fa Bois, F.R.A.S.—"Arm Chair Science", July 1937.

41. By 'visible' is meant not only to the naked eye but also through the most powerful microscope.

42. The mechanism of nature by Dr. Anelrade E.N.D. Sc. Ph.D. page 37.

skandhas in the small amount of air which can be contained in a single tiny hair-pit. Science has estimated that in a cubic inch of air there are 4424 x 10 molecules.[43] Thus there are many instances illustrating the compressibility and density of matter, in both sides.

Absolute and Empirical Paramanu

Jainology gives two kinds of 'paramanus' absolute and empirical. The most ultimate indivisible unit of matter is absolute 'paramanu' while a 'skandha' or aggregate which is infinitesimally small by sense perception is an empirical 'paramanu'. In science these two divisions have automatically come in. The particle, which was given the name of 'atom' which in Greek means 'indivisible', is proved to be divisible and hence cannot be called 'atom'. But in practice it continues to be called an 'atom'; so it can really be termed as 'empirical atom'. According to Jainology even electron and other particles are also 'empirical paramanus' only, as has already been shown.

Various Types and States

Matter is shown to be of six types in Jainology:

(1) Very Gross —Land, mountain etc.

(2) Gross —Water, Oil, Ghee etc.

43. This number is for normal pressure. It can be increased many times by compressing the air. In a room 15'x10'x9' high, there are about 1027 molecules in normal conditions.

(3) Fine Gross —Air and other gases.

(4) Gross fine —Light, shadows etc.

(5) Fine —Matter of thought and speech etc.

(6) Very fine —Skandhas composed of two, three etc. 'paramanus'.

Science gives three physical states of matter viz. (1) solid (2) liquid and (3) gaseous, and these correspond with the first three divisions given above. Philosophers knew the existence of more than the three states of matter and so gave six divisions. In science also it is now accepted that not only visible light but also X-rays and 'gamma rays' which are electro-magnetic radiations are all material. Philosophers have divided material bodies from various other stand-points also e.g. (1) naturally formed (2) artificially formed and (3) partly naturally and partly artificially formed.

Sound

Jainology considers sound to be one of the attributes of matter. How this attribute is effected has been discussed briefly in 'Panchastikayasara'. It is stated there that: 'Paramanu' itself does not possess the property of sound; sound is produced by various aggregates rubbing together; it is, therefore, an attribute of the aggregates." Jainologists have also stated that "sound can reach the other end of the universe, if strongly produced." Some people believe that radio etc. have corroborated the above statement.

But it is not so simple, because science does not consider sound as material or corpuscular. It (science) considers sound thus—it is a common experience that a source of sound is in a state of vibrations. For example, the prong of a tuning fork, a bell, the strings of a piano and the air in an organ pipe are all in a state of vibration where they are producing sound.[44]

According to science, sound is also a form of energy. It is propagated in wave form. Waves of sound are transformed into electro-magnetic energy by the mechanism of microphones, radio etc. and is propagated in the form of electric current which is re-transformed into sound at the listening end. The velocity of sound (in air) is 1100 miles per hour. But it can be propagated at the velocity of light when transformed into electro-magnetic energy. Jainologists say that 'Sound is material and can reach the other end of the universe'. Scientists say 'Sound is not matter but energy and travels at the rate of 1100 miles per hour. There is, thus, a sharp difference between the two beliefs. It cannot, therefore, be simply said that the invention of radio etc. has lent corroboration to the Jain beliefs about sound. But, if we think deeply, the saying is not entirely baseless either, because the duality of matter and energy has converged into unity in the modern science. This is true not only about sound but also about the other forms

44. Text Book of Physics—by R. S. Willows page 249.

of energy and matter which are accepted as two modes of the same thing. Jainologists considered all forms of light to be material, but science believed them to be only energy (different from matter). Jainologists had categorically stated "There is no separate reality called energy—different from matter. The thing which we call energy in science is but a minute or fine form of matter." It is gratifying to learn that science has now accepted this as a proved fact.

Does energy possess mass? According to Galilean or Newtonian principles the answer to this question was a plain 'No'. But Einstein's Theory of Relativity proves that energy is not without mass, but does possess mass in definite proportions. The mass of the thermal energy required to convert one thousand tons of water will be just under 1.30 gramme. But more simply it can be said that the mass of the thermal energy produced by the combustion of 3000 tons of coal will be approximately one 'masra'. Energy was not believed to be matter because it possesses very little mass. That is why it was considered as a mass-less propagation.

Radiation from sun is also energy. Max Born has shown that 'the sun loses in one year 138,00,00,00,000 tons of mass by its radiations'.[45] In the same book he says that 'energy and mass are just different

45. Restless universe.

names for the same thing'. In fact, there now exists a simple mathematical equation for converting energy into mass and vice versa.[46] After this much discussion, we easily come to the conclusion that radio microphones and loud-speakers etc. have amply justified the stand taken by Jainologists for the nature of sound. Sound, even though a form of energy is not different from matter. To convert the sound waves into electric current and to radiate them in the form of electro-magnetic waves is, of course, a 'strong effort' and that is what the Jainologists had stated when they observed that: "If produced by a strong effort, the sound can reach the other end of the Universe."

Image, Reflection and Television

Jainology described the phenomenon of optical images thus: "Every visible material body radiates at every instant its own image and this is propagated in all directions in the whole universe, away from the body. Wherever it encounters a reflecting surface it is reflected. Reflecting bodies are mirrors, oil, ghee, water etc. It appears that the development of Television in the field of science is based on and illustrates this principle. This has made it possible to send the image of somebody speaking in one country to another country on either sides of ocean. Just as a radio mechanism transforms the sound

46. $M—E|C^2$ or $E\text{-}MC^2$.

waves into electric energy, propagates them thousands of miles and retransforms them at the listening end; in the same way television mechanism transforms the radiating image of a body propagates it thousands of miles and retransforms it as an image at the receiving end.

The Triplet—Formation, Decay and Continuity

The principle embodying the triplet give better space in between formation decay and continuity—is the fundamental base, according to Jainology, which reveals the nature of realities. The gist of it is that in reality at every instant new modes are formed, old ones are destroyed and the substance continues to exist through the changes. Modern science also agrees fully with this principle. After accepting the interchangeability of matter and energy, this has become even more clear. Mass is transformed into energy but energy also is indestructible and is transformed into some mode or another. In his book 'Thesis on Energy', L. A. Colding writes:

"Energy is imperishable and immortal and therefore, wherever and whenever energy seems to vanish in performing certain mechanical and other works, it merely undergoes a transformation and reappears in a new form but the total quantity of energy continues to remain constant. The conclusion is that a substance may disintegrate into atoms and

atoms may be split into electrons, protons and energy, but a substance is never totally destroyed. Just as matter is transformed into energy, the latter can also be transformed into matter.[47] That is why the principle of conservation of matter (incorporating the old time principle of conservation of energy) is the fundamental base of physical science even today.

Definition and Characteristic

Philosophers have defined matter:

"That which possesses colour, smell, taste and touch, is matter."

Colour is perceptible by the sense of seeing and in the same way, smell, taste and touch are perceptible by the senses of smelling, tasting and touching, respectively. Hence, we can also say that 'whatever is perceptible by senses is matter'; but the converse that 'all matter is perceptible by senses' is not true, because in some modes it is imperceptible. Be that as, it may, the definition of the matter given by the philosopher is faultless. Science defines matter thus: "That which possesses length, breadth and thickness is matter." Compared to the above definition this appears to be very gross; 'paramanus' are for ever left out by this definition.

47. A typical instance of the latter transformation is what is known as 'pair formation' by which a positive and negative electron are formed from the energy of strong gamma radiation, when it passes close to an atomic nucleus.

Atomic Energy and Tejouleshya

We have already described atom bomb and hydrogen bomb, the two special instances of atomic energy. Both these atomic weapons prove to the hilt the definition of 'Pudgala' i.e. matter viz. 'Fusion and fission are two characteristic properties of matter'. 'Put' means fusion and 'Gala' means fission. Hydrogen bomb is an instance of the fusion property, because 4 nuclei of Hydrogen atoms are fused to produce one Helium nucleus and the process transforms a small mass into tremendous energy. Atom bomb is based on the fissionable Uranium—235 atoms and hence becomes an instance of the 'Gala' or fission property of matter.

'Tejouleshya' is an instance in Jainology, which depicts the tremendous power of atomic energy. 'Tejouleshya' is material and if radiated fully can reduce sixteen states like Bengal and Bihar to ashes. The use of its power is acquired only by an austere sadhu by the virtue of his special prescribed penances. The penances are specified in the canons. Proof of its material origin is available in the questions and answers which passed between Sadhu Kalodayi and Lord Mahavira.

Sadhu Kalodayi asked: "Oh Lord! Just as fire containing fire-beings light up things, do the material bodies of the fire without fire-beings also light-up, shine and heat?

Lord Mahavira replied: "Yes! Kalodayin! material fire also throws light and shines."

Kalodayi: "Oh Lord! which material bodies throw-light and shine and heat?"

Lord Mahavira: "Oh Kalodayin! Tejouleshya released by an angry sadhu falls far or near according to the throw. This Tejouleshya, wherever it falls, its material bodies throw light, shine and heat."

It is clear from the above discussion that 'Tejouleshya' is also a sort of chemical reaction. To take only one meal every third day, to eat boiled urad (black gram) and drink hot boiled water and to stand before the blazing sun with arms stretched overhead which are some of the prescribed penances indicate a sort of chemical formula for the production of Tejouleshya. High temperatures are necessary for nuclear reactions. Similarly, all the prescribed actions necessary for 'Tejouleshya' tend to increase the heat of body tremendously. But there is one speciality about 'Tejouleshya viz. while a nuclear explosion can result in the generation of high temperatures only, 'Tejouleshya can be 'hot' or 'cold' as willed, as both hot and cold T'ejouleshyas' are described in the cannons. The cold type of 'Tejouleshya' can neutralise completely the effect of 'hot' 'Tejouleshya'. While we come across the prescription for acquiring hot 'Tejouleshya' in the canons the same for acquiring cold one is not to be found anywhere. Science has also invented so

far only hot atoms and hydrogen-bombs. An antidote for the nuclear weapons is still to be worked out. We do not mean to say that 'Tejouleshya' and nuclear bombs are one and the same thing but the marked similarity between the two is certainly enough at least to give rise to great curiosities.

Conclusion

Just as Jain Philosophy has propounded unparalleled precepts about non-violence, non-absolutism, salvation and other philosophical and metaphysical subjects, its contributions in the field of physics and other material sciences are also unique. When it has been amply clear from various considerations that the modern science itself in its development at each step is only following the various principles already enunciated by it (Jainology) there remains nothing to talk about other systems of philosophy. Many thinkers with a scientific bias brush aside this topic by merely stating that there cannot be any comparison between ancient philosophical ideas and the studies in modern science on the subject of micro-cosmology. Philosophers could only have a minimum knowledge of the subject. This knowledge, having been developed and transformed in the field of science, has changed basically. Hence, the philosophers' knowledge has little importance in the modern times. But the fact is that such thinkers have never cared to spend any time in studying the ancient cos-

mology nor ever considered it necessary to do so. They go round and round about their own dogmatic belief that in ancient times there was no development of cosmology. We are sure that if efforts are made, with an impartial mind, in the direction of studying the ancient Jain Cosmology and make necessary researches in the subject, this dogmatic belief will indeed undergo a basic transformation.

Jain micro-cosmology indeed appears to be complete and comprehensive. The principles, enunciated in it thousands of years ago, seem modern even today. New theories have been established in the place of old ones. In future, the possibility of more new theories replacing the old ones is even greater still. The book 'Atom and Universe' was recently (in 1956) published from London. Its authors are well-know authorities on modern physics. G. O. Jones, J. Rotblat and C. J. Whitrow discussing the elementary particles found inside the atom they write (page 49) "We have gone a long way from the simple picture of universe which required only three particles (electron, proton and neutron) to build up all matter. At the moment at least sixteen elementary particles are known and the existence of as many again is possible. . . . . The great multiplicity of these particles is highly unsatisfactory and raises the question of what we really mean by an elementary particle. Originally the name was applied to the four elements: fire, earth, air and water. Later it was thought that

the atom of each chemical element was an elementary particle. Then the term was limited to three only, proton, neutron and electron. It has now been extended to over twenty particles, and still more yet to be discovered. Is there really a need for so many units of matter, or is this multiplicity of particles an expression of our total ignorance of the true nature of ultimate structure of matter? At the moment, despite the remarkable progress made in nuclear physics, the riddle of elementary particles still remains unsolved."

Well! If in today's electrical and mechanical age, the riddle of elementary particle remains unsolved, how did the Jain seers, unperturbed by the absence of assistance from laboratories and mechanical equipments, study, discuss and soberly and boldly assert, the indivisibility of 'paramanu'; the triplet of formation, decay and continuity; the fundamental properties of fusion and fission and the principle of conservation or indestructibility of matter? This question alone is sufficient incentive for the inquisitive to leave the tiny pond of the knowledge by sensuous cognition and make him gaze eagerly towards the ocean of perfect knowledge by spiritual intuition.

CHAPTER 4

ESSENCE OF SOUL

"Who am I? Where have I come from? and what is my goal?" are the most important and difficult questions of life. Every philosophy of the world owes its development to these poignant questions. When Science entered the field of nature and started to investigate into the substance, it too, was faced with these very questions. If we look back in retrospect to discover the origin of these questions, we shall come to the inevitable conclusion that they have confronted humanity and human beings since the beginning of the universe. A little thought convinces us that there are only two answers to these very confronting questions. One is that, 'You are the eternal living entity in its essence, which moves in different forms and bodies according to deeds good or bad and that your sole aim is the achievement of Salvation—'Moksha'. The other answer is, 'That before and after the present life on this earth, you were and will be nothing'. These answers are as much contradictory to each other as day is to night and in spite of the fact that humanity has devoted itself to the solution of these two questions since eternity, it has not been able to reach a final conclusion till now.

To determine the goal of life, it is essential that the 'essence of soul' be properly evaluated. To understand this we have to attach such importance to the subject 'Soul' as the great seers have done in the past; the faith on which it is based and the logical explanations given by them. We have also to consider what science has to say about researches made by it regarding 'Soul' and we have to study the new ideology advanced by the twentieth century on this subject. In other words our study of such a subject will bring us to the question whether the East is inclined towards the West or the West towards the East; and whether science is trying to follow the lines of philosophy or philosophy is trying to follow the lines of science in particular regard to the question of 'Soul'.

Vedic View

Nachiketa and the Knowledge of Soul

Rishi Vajashravas the father of young Nachiketa had a desire to give away all his worldly possessions in charity. He honoured his desire one day and gave away all that he had. As all his belongings were being taken away one after another by their recepients, the young Nachiketa became more and more apprehensive as he thought that his father would give him away too. At last he could not resist asking his father: "O father! whom shall you give me to?"

Rishi Vajashravas kept silent for a time. But the young Nachiketa was anxious. He repeated his ques-

tion to his father. And his father said at last "I shall give you to death." On hearing this rather cruel reply the young Nachiketa became somewhat perplexed. He had the body of a little child but it bore within itself the soul of an adult man. The period of his reincarnation in the mortal world was nearing completion; and to be free from the peril of death, he decided to go straight to Yamraj. When Nachiketa reached the home of Yamraj (the God of death) he was not there. But Nachiketa waited and waited for him so much so that he waited for three days at the doors of Yamraj without food and water. Atlast when Yamraj returned he became very charitable towards the thirsty and hungry child. 'Nachiketa'! "Nachiketa!", said Yamraj to the young boy, "You have waited at my doors for three days without taking even a morsel of food and a drop of water. You have put me under your obligation by doing that. I therefore grant you three boons. Ask for any three things and I shall give them to you." Nachiketa asked for two boons and he got them. When it came to the third, Nachiketa said, "O Lord! some people say that after death the soul also perishes; others say it does not. Pray, my Lord, tell me what is the truth. This is the third boon that I ask of you."[1] Yamraj was so pleased to have been asked for this boon that he imparted to Nachiketa not only the knowledge of this mortal world but also the knowledge pertaining to the

1. Kathoupnishad 1-20.

worlds hereafter and explained to Nachiketa that after leaving this world and the form occupied by it in this world the 'soul' goes to the other world. "Soul never perishes" he told Nachiketa. The curiosity of Nachiketa did not end then and he asked Yamraj whether there could be an end to the chain of death in the next world. The reply from Yamraj was that "unless the soul attains salvation, the fear of death exists everywhere." On this the young Nachiketa said to Yamraj, "Oh Lord please show to me the path of Salvation so that I have not to die. I wish to acquire only this knowledge and no other knowledge about the non-self —(the matter)."

Yamraj tried hard to persuade Nachiketa not to ask for the attainment of this knowledge. "Do not ask for this knowledge, Nachiketa. It is very difficult to attain it. It is not so easy. Even Angels are doubtful of their knowledge on this subject"[2] he told Nachiketa. But the child was very firm over his demand. "Give me the eternal life, O Lord," he continued requesting to Yamraj. Atlast Yamraj could not desist anymore and he gave to Nachilketa all the knowledge that leads to the attainment of Salvation. Nachiketa having acquired from the Yamraj all the Yogic pracitces for the realisation of soul, practiced them and attained the realisation of Brahma Godhood. His mind was purified from the malice of attachment and hatred and he attained salvation. Similarly, any

2. Kathoupnishad 1-21.

other human being who realises the 'soul' and acts for its attainment, can also get eternal life."[3]

Maitreyi

Yagnavalkya turned his back to the material world and was handing over all his worldly possessions to his wife Maitrayi. But something dawned on Maitrayi and she asked of the Rishi—her husband: 'Shall I get eternal life with all these possessions'.

"No dear," the Rishi answered in a firm tone.

'What then shall I do with all these worldly things, if I cannot attain eternal life by possessing them'[4] she asked.

Maitrayi was renounceful in her attitude towards all those worldly possessions and so Yagnavalkya gave to her the knowledge of 'soul'.

Sanat Kumar and Narad

In this very context and in order to understand the importance that the possession of knowledge of soul has, the story of Narad and Sanatkumar is very important.

Narad went to Sanatkumar and requested him to impart some knowledge to him. "Tell me first of all

3. Kathoupnishad 6-18.
4. Vrihadaranyakopanishad.

what you have studied so far," said Sanatkumar to Narad.

"I have studied all the four Vedas (Rig, Yajur, Sam and Atharva). Besides, like the fifth Veda I have studied history, grammer, Shraddh, Kalpa, Arithmetic, Uttpat, the science of omens and of supernatural powers, the knowledge of searching hidden treasures the science of different forms, logic, the science of elocution, and of arguments, ethics, politics, the knowledge pertaining to angels, the dictionary, the theories of education, the knowledge of poetries and rythms, black magic, archery. 'I have also studied', continued Narad, 'the science of warfare, astrology, the knowledge about snakes, the knowledge about Gandharvas. I know all the 64 arts including singing, music, dancing, sculpture and cooking. I know so much and have learnt all this but I feel that my knowledge is only superficial and with all this knowledge I have not realised or understood the inner soul. I have come to know that those who have realised the soul are free from sorrow, whereas with all the knowledge that I have attained I am full of sorrow. 'So, Sanatkumar Jee', requested Narad, "Give me that knowledge—the knowledge of soul by the possession of which I will be free from sorrow."[5]

This instance only helps us to realise the very great importance of knowledge of soul. Man's trea-

5. Chhandyogupnishad 7-1.

sure of knowledge is miserably incomplete, howsoever, rich it might be unless he possesses the knowledge about 'soul' also. Manu has also expressed the same opinion with regard to the knowledge of soul. "Amongst all knowledges" he said "the knowledge about soul is the noblest. It is the foremost amongst all Vidyas—(learning) and it is with this knowledge that man attains salvation."[6]

When we turn to Gita we find the same teaching being imparted to us. The following passage from Gita vividly explains the central theme of all the views expressed by Vedic philosophies with regard to the knowledge of soul:

'As a man throws away his old clothes, and puts on new ones, so the soul leaves behind one worldly form and enters the new one."[7] No weapon can disect the soul, nor can fire burn it. Neither air nor water has any effect over it. In other words water can not make the soul wet nor can air dry it up.[8] The substance which does not exist cannot be created and the substance which exists cannot be destroyed."[9]

Philosophers have advanced similar theories for the existing and non-existing entities. We do not find such explicit and advanced ideas about re-birth in the

6. Manu, Chapter 12.
7. Geeta—Chapter 2, S. 22.
8. Geeta—Chapter 2, S. 23.
9. Geeta—Chapter 2, S. 16.

Vedas, as we find in other Vedic literature; but Vedas, still are, the main fountain-head of all theories with Vedic traditions. The theme of Vedas has developed on the very searching question of "From where has this world come and how and from where did it originate.?"

All the five known schools of philosophy, viz. Nayayika, Vaisesika, Sankhya, Mimansa, and Yoga, their branches and sub-branches, have originated out of Vedic traditions. All the philosophers belonging to the different schools of philosophy have independently and in their own way of thinking defined the 'soul' and 'salvation' etc.; but the main source of inspiration and knowledge behind such propundings are the Vedas. Some philosophers believe that soul is a small thing like the atom while others say that it is infinitesome and pervading the whole universe. Some regard it as an independent entity while others accept it as a part of the indivisible Substance. To this extent the philosophers have differed in their thoughts but they are unanimous with regard to subjects of re-birth, Karma, knowledge, the life, and the experience of eternity etc. In other words all the philosophers have agreed on this theistic view point as opposed to atheism.

Buddhist View

Buddhist philosophy has its own distinctive view point on the subject of soul. It imitates the CHAR-

VAKA philosophy of Brihaspati in some respects; while in others it imitates the highest theistic view points preached by the Vedas and Jain philosophy. It appears that Buddhist philosophy has adopted the middle course over the subject of Soul and re-birth in its traditional way of adhering to the middle course over such other controversial issues. Buddhists were theists and atheists at the same time. On the one hand they sharply criticise and refute the theories about the eternal duration of the soul and on the other they accept all the theories about the position of soul, which have met the acceptance and approval of the theists. And to crown all this, though they profess to be the propounders of 'Atheism' and 'Nihilism', they accept the theory of Karmas—the theory of good and bad deeds—and the theories of re-birth and salvation. Under such circumstances one can happily and safely arrive at the conclusion that Buddhist Philosophy is also a theistic philosophy. Buddhist Philosophy uses the words, Pudgal (matter) Jeeva (life), Atma (self) and Satta (reality) as synonimous. For them things which are known by these different words, have got no different and independent existence as such. The only two related things and common qualities in these words are either the 'soul' or the 'matter'. Buddhist philosophy denies the existence of 'soul' as such in theory but it does not do so in practice. In other words according to Buddhist Philosophy the existence of soul is nothing but an aggregate of five

things viz. the material form (Rupa), the feeling (Vedna), the perception (sangna), co-efficients of consciousness (samskara) and the consciousness (vignana). Excepting for a combination of all these, the soul has no independent real existence.

The Buddhist philosophy does not accept the real independent existence of the soul, but accepts the existence of the mind and its different mental states. They define th abov fiv things (skandhas) as follows:

1. The Form (Rupa Skandha):

The etimological origin of the word 'RUPA'—the form, is explained in two ways. One is: "Rupyante Aebhir Vishya" i.e. that by which the subject is introduced. The other is "Rupante iti Rupani" i.e. the thing which is introduced viz. the subject. Thus the Rupa skandha is expressive of the senses and the body which is in contact with the subject.

2. The Initial Consciousness: Vigyan skandha. This pertains to the knowledge of self, and that of form and taste etc. through senses. Both these knowledges are predicable by Vigyan Skandha.

3. Feeling or Experience: Vedna Skandha:

After securing the knowledge of external things the effect such a knowledge has on the mind is of three types (i) that which causes happiness, (ii) that which causes pain and (iii) that which causes neither pain nor happiness.

4. The designation: Sangya Skandha:

The explicit knowledge we secure on the basis of sense and experience and the name we give to the object based on that sense and experience only shows that 'this is something' or 'at Kinchit Idam' and in designating it we go even further upto its name and its type. In 'IMPRESSION' are included all the mental activities. Equally important are the elements of affection and rancour. Love, rancour, affliction, pride, and arrogance etc. along with religion fall under this skandha.

The essence of Buddhist Philosophy is the association of all these principals (skandhas)—association which means the combination and collection of these principles.[10] Accordingly Buddha has always answered in a somewhat mysterious way all the questions relating to the subject of 'SOUL'. This view is revealed from the following dialogue between King Pashan and Lord Buddha:

Once King Pashan asked Lord Buddha,[11] "O, Lord' enlighten me whether Tathagata exists after death or not."

Buddha replied "O King the answer to your question is inexpressible."

The king again asked: "Does not then Tathgata

10. Bhamti.
11. Samyukta Nikaya.

exist after death, O, Lord!"

Buddha: "O, King! the answer to this question is also inexpressible."

On this the king said to Lord Buddha, "O, Lord! then should we say that Tathagata both exists as well as does not exist after death."

Lord Buddha replied; "This too is inexpressible".

Thereupon the king asked "O, Lord! why is it left unexplained?"

"To answer this why?" Buddha said, "I ask of you O, King! if there is anyone in your court who can count the drops of water in an ocean or the particles of dust in the desert."

"There is no such man, My, Lord!" the king said.

"Why?" asked Buddha of the king. And the king was satisfied with the indirect answer to his question of 'WHY'?

The question of soul and rebirth becomes shrouded in deeper mystery as we study the above dialogue between Lord Buddha and King Pashan. Let us therefore, examine this from whatever knowledge we can obtain from another important dialogue between Nagsen and the Greek King, Millind.

Nagsen has explained very explicitly and clearly

to the Greek king, the mystery of soul as explained and understood by Lord Buddha. The following dialogue is illustrative of this.

"O, Nagsen" said King Millind to Nagsen "Your disciples call you by the name of Nagsen. Is your hair, Nagsen, My, lord?"

"No, O! King", was the reply.

"Then, is the hair on the body Nagsen?" the king asked.

"No! O, King!" was the reply once again.

"Then O, Nagsen!" the king again asked, "Are these nails, these teeth, or this skin, or this flesh, or this sinew, or these bones, or this heart, or this liver, or this spleen, or this pair of lungs or these intestines, or this bile, phelm or corpsels, or blood or perspiration or fat or tears or saliva or this brain, Nagsen?"

"No! O, King!" was the reply even then.

"O, Lord! then, is your form Nagsen? Or is your senses or experiences Nagsen? Or is your perception or initial consciousness Nagsen?"

"No, O! King," said Nagsen firmly.

"O, Saint! Is the material form, the feeling, the consciousness and perception all put together Nagsen?"

"No, O! King!" replied Nagsen once again.

"Then", said the king 'is Nagsen different from this form, this feeling etc?"

"No,! King!" said Nagsen once again.

"O, Saint!" said the king atlast, "I am tired of asking questions of you, but still I am not able to find what is Nagsen? Is Nagsen only a word? After all, who is Nagsen? It appears to be a lie when you say that Nagsen is nobody."

Finding that the king was nearly exhausted the long lived Nagsen asked King Millind, "O, Kshyatriya! You are very delicate. Did you come here walking on this stony road and burning sand made all the more hot by the heat of the afternoon sun or did you use some vehicle to come here."

"I have not come walking O! Saint! I came by a chariot", said the king.

"If you have come by chariot, O, King", said Nagsen, "then show me where your chariot is?"

The chariot was brought to the presence of the king and Nagsen. Thereupon Nagsen said, "O, King! is this pole the chariot?"

"No. O! Saint!" said the king.

"Is this axle the chariot?" asked Nagsen again.

"No, Sir!" Nagsen said.

"Are these wheels the chariot?" Nagsen again

asked the king.

"No, my Saint!" was the reply.

"O, King then are these poles, the axle and the wheels put together the chariot", asked Nagsen.

"No, O! saint," Nagsen said.

"Then O, King is the chariot something different from the pole etc." said Nagsen again.

"No, Sir!" Nagsen said.

"O! King!" said Nagsen, "I am tired of asking questions of you still I have not been able to discover what the chariot is. Afterall what your chariot is? Do you speak a lie that there is no chariot? O, King, you are the mightiest king in the whole of Jambu Dwip. Due to wohse fear do you speak that lie?"

"O, Great Saint!" said King Millind to Nagsen, "I am not speaking a lie. The poles, the axle and the wheels etc. are just parts of the chariot but it is customary that we call it a chariot."

"Very good, O, King!" said Nagsen, "Afterall you have known what the chariot is. In the same way because of the hair etc., it is only customary that you give to all these things the name Nagsen; but spiritually there exists nothing by the name of Nagsen." It is in this conversation that we discover a very true and apt explanation of Soul according to Buddhist philosophy.

Rebirth:

According to the propoundings of Lord Buddha if the soul is not real and only an aggregate then what and who is reborn? Lord Buddha believed in the theories of re-birth and Karma and this fact is vividly held out from the following instance:

Once a thorn pricked Lord Buddha's foot. On this happening Lord Buddha told his diciples "Monks, in the 91st birth before my present birth one man was killed by me. It is as a result of that Karma that this thorn has pricked my foot.[12] The firm belief in the theory of karma on one side and the impermanence of the soul on the other hand cause unnecessary complications. And this complicated condition is explained by the aid of an illustration of the flame of a lamp. In the ordinary way it is believed that the same flame burns for the whole night. But actually the fact is something different. The flame that was glowing in the first instance is entirely distinct from the flame that glows in the second instance. Not only this but they are absolutely different from each other. We can realise this by a little thinking. It is the oil that burns in a continuous stream and the flame is only a result of the burning of that oil. At every stage new oil gets up and a new flame is created in very quick succession of course. But externally it appears that the flame is static.

Same is the condition of soul according to Bud-

12. Shaddarshan Samuchaya Tika.

dhist philosophy.[13] In the Millind questionaire it has been shown that for the existence of anything a new state originates and the old one is destroyed and in this manner the continuous stream of origin and destruction continues. There is no gap of even a single moment in the operation of the process of origination and destruction and as one state gets destroyed the other state originates. For the same reason at the time of rebirth neither does the same soul exist nor is it absolutely changed into another one. As the last consciousness of one birth is destroyed the first consciousness of the second birth originates.

Absolute Theism:

The opinion regarding SOUL has been differently expressed by the Buddhist Philosophy. But everyone of such expressions of philosophy end with the expression of the type of SOUL that the Buddhist philosophy believes in. Going into these conclusions we find that atleast so much is definite that the Buddhist philosophy about soul is not the atheistic type. It is not the one that does not believe in rebirth, the theory of karma, heaven, hell and salvation. The conclusion is that the Buddhist philosophy about the SOUL is based on theistic grounds and strongest reflections of such theistic reflections of Gautam Buddha are found in Dirgha Nikay. Pamasi, the king of Setyua, was a staunt atheist, He never believed in things like

13. Hindi translation p. 49-50.

heaven and hell; vice and virtue and even salvation. He was very cruel too. Once he put many atheistic questions to the young monk Kashyapa (the monk diciple of Lord Buddha).[14] Kashyapa with powerful and talented arguments refuted all the atheistic beliefs and questions of Pamasi and uniquely established the theistic view point.

The preachings and actions of Lord Buddha himself were basically non-violent. The highest aim of his life was to achieve emanicipation. He himself was ascetic in his living and was preaching to others to accept the ascetic way of life. Atheists and those who do not believe in rebirth can never even remotely imagine to lead an ascetic life. Buddha, in his preachings has always supported the theistic views. His very common preachings were 'He who kills, speaks a lie, steals, commits adultery, drinks, and practices such other vices digs his own grave."[15] The commandments of Lord Buddha were "Abstinence from all evils, acquisition of the good, and purification of one's own mind."[16]

Jain View

From the original point of view we can safely rely upon the belief that the eternal aspect of soul has not been so vividly and explicitely explained in any other philosophic texts as we find it defined in Jain

14. Hindi translation p. 199-24.
15. Dhanmu Pad 18-12-13.
16. Dhanm Pad 14-5.

scriptures. In the preachings of Lord Mahavira the picture of soul is always very clearly marked. Answering the question 'what is this Universe?' Lord Mahavira says that the universe is an aggregate of the six real substances viz., Dharma, Adharma, Space. Time (Kaal) Matter (Pudgal) and Soul.[17] In this way according to Lord Mahavira, soul is considered to be a real and eternal substance. The potent questions of life which Lord Buddha bye-passed by calling them 'undeterminable' were answered by Lord Mahavira in a simple and straightforward manner. The words used by Lord Mahavira to give those answers were very simple but they conveyed very deep meanings.[18]

From the point of view of substance one soul is finite. Spatially it occupies innumerable space-points but is finite. Temporally it existed in the past, it exists in the present and it will exist for ever. It is perpetual and eternal. In its intrinsic spirit the soul is knowledge, faith, conduct, and is neither heavy nor light. In model expressions it is infinite and eternal.

Explaining why there is happiness and misery in life Lord Mahavira said that the soul itself is the creator of its own happiness or misery as it associates itself either with good or bad deeds; and is in itself its own friend and foe.

In his preachings, Lord Mahavira has discussed

17. Uttradhyan. Sutra 28.
18. Bhagwati Shatak 2-1.

things pertaining to the present life as well as the life after the 'death', and he has shown the path to attain happiness in both of them. 'One who restrains his soul is happy in both lives,'[19] he said and he showed that the properties of the soul are knowledge, faith, conduct, penance, spiritual strength and consciousness.[20] In Jain scriptures we come across a discussions of atheistic philosophy and its criticism. In the first chapter of Sutrakritang a number of old doctrines have been discussed and described it has been said about atheists—"There are some who regard soul as an evolute of the five material elements viz., earth, air, water, fire and space and regard it as destroyed along with the dissolution of these elements."

Shilangacharya, a great Jain commentator, defining this passage criticises the above belief and observes 'The combination of the elements is an independent characteristic. Consciousness is not its property because the elements—earth, air, water, fire and space —have other independent properties. By the collection of substances which have absolutely other qualities, a unique and common property cannot be originated. As by the collection of the dry sand-particles oil cannot be obtained; and by the collection of pot and cloth a pillar cannot result; similarly consciousness can be the property only of the soul and not of the

19. Uttradhyan 1-55.
20. Uttradhyan 28-11.

inanimate elements. Quoting from the observations of another critic, Shilangacharya gives to us a second argument on this point: 'By the combination of five elements of different qualities consciousness cannot originate because it is evident that all the five senses have the knowledge of their own subjects. The subject known by one sense cannot be known by another sense. And with these observations we naturally come to the conclusion there is without doubt a substance called the soul which has the collective experience of the subject which is known by the five different senses.

Acharang Sutra, the first of the eleven Jain scriptures, which historically too is the oldest Jain scripture, begins with the following observation about the significance of the soul. "So many people do not know where I have come from? Shall I go to the next life or not? Who am I? and where shall I go from here?[21] In the fifth original scripture Bhagvati, the soul has been very clearly explained and it has been said that the "Soul is eternal, death less, imperishable, undecaying, perpetual and permanent."[22]

On one occasion while answering some questions of his disciple Gautam Muni, Lord Mahavira, describes the soul as non-eternal too. In this context it will be of interest to study the following dialogue between Gautam Muni and Lord Mahavira:

21. Acharang 1-1.
22. Bhagwati —Ud.

"O, Lord, Is the soul eternal or non-eternal."

"Gautam," said Lord Mahavira, "the soul is eternal as well as non-eternal"

"O, Lord", asked Gautam Muni "with what end in view can it be said that the soul is eternal as well as non-eternal?"

"Gautam", replied Lord Mahavira, "from the point of view of substance the soul is eternal but from the point of view of different modes it is non-eternal."[23]

Lord Mahavira never looked upon any subject from exclusively one angle only. He used to judge all things from different angles. As will be seen in the above cited discussion between Lord Mahavira and Gautam Muni, it appears to be a contradictory statement that the soul can be eternal and non-eternal at the same time. But looking at the explanation given by Lord Mahavira to this contradictory appearance of his words, one finds that he has expressed his ideas from different points of view and they are respectively correct in the context of those respective points of view in spite of their appearing to be contradictory.

In the above dialogue the word, 'From the point of view of substance' bear reference to the soul itself. So putting the underlying idea of the above discourse in other words we come to the conclusion that from

23. Bhagwad Shatak 7-4.

the point of view of consciousness the soul is eternal. This consciousness of the soul existed in the past, it exists in the present and it will continue to exist for ever in future also. In the same discourse the words 'From the point of view of different modes' means that the soul changes its external appearance or garb. The same soul adopts different material forms of life and even in the same life it changes its modes; from childhood it developes into youth and from youth it changes to old age.

So, the soul is eternal and to cross over and reach the other shore of this ocean of births and deaths is its aim. We come across a detailed explanation of this fact in an utterance of Kesi Gautam and this utterance in itself is a noteworthy passage from Uttradhyayan. In this passage "the body is considered to be a boat, the soul is considered to be the boatman and the world is the ocean. The great saints cross this ocean."

"When the self, completely eliminating karmic (non-self) matter and being absolutely pure, achieves salvation, it establishes itself on the topmost part of the universe and it is liberated for ever."[24] This quotation amply explains to us as to how the soul liberated from the matter (non-self) exists.

As in other age-old scriptures similarly in Jain

24. Dashvaikalika 4-19-

scriptures also, there is not only an apparent explanation of the soul but also a lofty and vivid discussion about it. "The soul itself is the knower; one who knows is the soul; and by whom the subject is known is also the soul itself. One who accepts these facts and realises them is the learned man and he is the theist."[25] . . . Atam Vadin.

The dissociation of soul from matter is explained in these words:

"My own soul possessed of right knowledge and right faith is the religious soul; all other bondages are the external dispositions" and further on "Egasschev maranam ego sijji nirao" i.e. death is one soul and salvation too is of one soul only.

At a Glance

To put it briefly, the form of soul according to Jain philosophy can be summed up as 'The soul is an independent, eternal substance. In the absence of a material and imminent couses it cannot be said to have been originated. One which is not originated cannot be destroyed. Its main characteristic is knowledge. In whatever form of life it be, it cannot be devoid of at least minute consciousness and experience. The essence of consciousness separates it from the inanimate substance. Due to inclinations developed by its action of the past life, a soul comes to

25. Acharang 1.

inhabit different form of bodies, successively while passing through the cycles of birth and death. With its own efforts it overcomes all the Karmas and attains salvation where its spiritual potentiality is manifest."

According to Jain Philosophy the soul has the characteristic of contraction and expansion. It consists of innumerable points known as pradesh. In contraction it can stay even in the smallest space but when expanded it pervades the whole inhabited universe (Loka). The soul associated with Karmas, occupies the space as per the dimensions of the body occupied by it. The soul of an elephant and that of an ant are originally alike. The only difference is that whereas one has been expanded into the body of an elephant the other has been contracted to that of an ant. If after death the soul of an elephant comes into the body of an ant, it contracts due to its characteristic of contraction and pervades the body of the ant wholly. Not a single point of the soul remains uncovered by the body. In the same way if after death the soul of an ant attains the life of an elephant it expands due to its characteristic of expansion and its pervades the whole body of the elephant. Here too, not a single point of the body remains without the soul.

One of the very important conception of the Jain Philosophy is that it believes in the plurality of souls. Each and every soul can become one with God after

eliminating all the past Karmas. All the living spirits are independent in themselves, they are not the parts of one whole substance.

Atheistic Philosophy

Atheistic philosophy, in one form or another has always existed in India along side of the other philosophies, and Acharya Brahaspati is believed to be its founder. Atheistic philosophy is also known as the Carvaka philosophy or the Lokayatika view. Its ideologies with reference to soul are directly opposite to all theistic philosophies. In short, Atheistic philosophy is as follows: 'The soul is not an original (real) substance and as such the question of its emancipation does not arise. In the absence of the original substance which is the soul, the existence of all vice and virtue and religion and irreligion (sin) and the result and effects of good and bad deeds is automatically invalidated. The Universe is that what we perceive. Eat, drink, and enjoy, therefore. That which is past is not yours. He who is dead will not return. The human body is only an aggregate of material elements. The earth, the water, the air and the fire are the bases of living organism. The dependable critique of knowledge (Pramana) is confined to perception. The soul originates with the combination of the four elements viz., the earth, water, air and fire, and is destroyed with their dissolution."[26]

26. Shaddarshan Samchchaya.

Indian philosophers have considered this Materialistic attitude as one of the six main systems in alternative grouping. When Naiyika and Vaisesika are, however considered to be two independent systems, frail and unconvincing reasoning does not entitle it (Atheistic attitude) to be placed with the main systems. Theistic logicians, on the strength of their knowledge and convincing reasoning have never allowed materialistic views, which have no fait hin the eternal existence of the soul, to develop and make progress in India. Such materialistic views have rather always met with severe criticism in India.

In studying the origin of the soul when Charvaka applied the argument of "the power of intoxicants" the theists counteracted the same by: "Nasad utpadyate nasad vinashyati". In other words that which is non-existent cannot be originated and that which is existent cannot be destroyed. The example of intoxicants is rather inapt. Grapes and molasses etc. already possess potentially the power of inebriating before combination. Fermentation only developes this power actively. Can it be said, however, that the material elements possess consciousness even potentially? If they do then there is no 'materialism' because it is then established that the life (consciousness) is eternal. Where there is an element there is life. If on the other hand the consciousness comes into being by their aggregation, the instance of intoxicant is rather out of

place, because in the material cause of wine (grape etc.) the power of intoxication already existed latently.

Atheists reasoned that the belief in the theory of rebirth makes one foresake what he has seen by wandering in the maze created by the flights of imagination about the unseen and that such a foresaking is his greatest folly. They emphasised that an intelligent man should by fair means or foul, achieve the enjoyments and joys of life which are imminent and tangible. What is imperceptible and not imminent is atleast doubtful if not totally non-existent.

The above was rebutted by the Theisists thus:

Even if we leave aside the philosophic examination of materialism and test it only from the point of view of practical life, we find that materialism is highly reproachable because it does not recognise sin—vice there is no, place for fear of sin. But in the absence of a fear of sin man becomes engaged in violence, falsehood, hiprocracy and such other foul means and immoral activities etc. in order to attain worldly happiness. Not to talk of the world hereafter but he even disturbs the social life of this world and to that extent atleast materialism is undesirable.

They further said "that even though the existence of the world hereafter is doubtful, good men should not indulge in immoral activities. What do they lose even if there is no world hereafter? On the other

hand if there does exist a world hereafter what will be the position of an immoral atheist?"[27]

Proof for the Existence of Soul

The learned saints who succeeded Lord Mahavira, the author of Agamas, too had decisive and definite views on the subject of soul. They created magnificient literature on this subject and held lofty discourses and defeated materialism with their compelling force of arguments. It is not possible to press into this book the whole history of such of their activities. But we are giving some noteworthy and good thoughts on this subject, picked up at random from important works, which are worthy of serious pondering.

1. "The existence of the soul is proved from the world soul itself. We cannot have an unreal designation of a derivative word."[28]

2. "The very thought whether the soul exists or not proves its existence, because Devdatta can think whether this is a pillar or a man while an inanimate substance cannot."[29]

3. "By seeing a pot we can have an idea of its maker—the potter. In the same way on seeing a body

27. Acharang Commentary.
28. Visheshavashyak.
29. Visheshavashyak Bhasya.

with a familiar shape, we know atonce the soul associated with the matter (karma) and having a shape."[30]

4. "Residing in a body that which thinks that it is not existing is itself the soul. No one except the soul can raise the doubt."[31]

In this way all theistic Indian philosophies whether whether Vedic, Buddha or Jain philosophy, each having its own independent views, on the subject of soul, become one on the point of rebirth. We have already seen in the preceding pages how theistic philosophers have refuted materialists. And to conclude all these arguments we can only say that materialistic views were never able to attain full-fledged philosophical status at any time in India. It is equally important to add at this stage without any exaggeration, that though there are different ideologies and philosophies, the whole Indian philosophy is one on the subject of rebirth of soul and its eternal existence.

Western Philosophies

If we drift aside for the time being from the Indian philosophy and peep into Western philosophic thoughts, we find that there is a general support for the idea of the eternal existence of the soul. Plato was one of the first philosophers in the

30. Visheshavashyak Bhasya.
31. Visheshavashyak Bhasya.

western part of the world and he has observed that "All the substances of this universe are dialectical, and so death after life and life after death is inevitable."[32] (History of Western Philosophy). Similarly other important and known philosophers like Socrates and Aristotle etc. had staunch faith in the theory or re-birth. Some western philosophers like Hegel have emphasised atheism also but according to philosophical traditions theism has always been considered superior in other western countries as in India.

Science and Soul

Bacon is considered to be the father of modern science. He determined the scientific definitions as different from philosophical ones.[33] As they were tangible and could be experimented upon people were enacted to the modern definitions of science. People started feeling that it is more respectable to be scientists than to be philosophers and the belief started growing that the era of philosophical age is out of date and that the era of scientific age has come and started developing.

Scientists tested the problem of soul and rebirth on the touchstone of science in the same manner in which they had tested other questions and problems. They explored subject like the origin of the universe and the origin of life. They came to the conclusion

32. Pashchatya Darshana Ka Itihas
33. Pashchatya Darshans ka Itihas.

that "Once upon a time the whole of this earth was a huge sphere of burning gas over the whole face of which the atoms were scattered. The atoms drew nearer and became united into aggregates. Then virus and bacteria came into existence. Then came Ameoba—a jelly like creature without bones. Then came immobile vegetable life which was taking its food directly from nature. After this came the moving animals who depended for their food upon others. After this came the fishes and amphibians. Some of them took to air while the others remained on the land. Then they started speaking and speech developed. After this came mamiferous ape—an anthropoid or a jungleman. The anthropoid developed into a primitive biped roaming about in the forests. "From amongst these bipeds some couples underwent such a great evolution that mutation occurred and in this way they became the first ancestors of our human race."[34] It is astonishing to note that science, which regarded and classed as ignorance and blind faith the traditional ideas of human beings regarding universe, accepted as scientific facts the above mentioned theories without their having been borne out by experiments and solely relying on imagination for their origin and existence. It is said for its own sake that the theory of evolution has been justified mostly by experiments. Great efforts have been made to impart to it an authentic touch by the acquired fossiles from

34. Manav Samaj p. 1.

the different parts of the world. Voluminous books have been written on the subject. But in spite of all this it does not react favourably upon the minds of earnest thinkers.

Many of the theories advanced by science in regard to Cosmology and Biology are obviously such that we can call them nothin but figments of imagination of some fertile scientific minds. For instance they say that the Earth is a piece separated from the sun; and as the moon rotates round the earth it also must be a piece torn from the earth. Other instances of such imaginative thinking on the part of science are that in the olden days the earth must have been like an apple and that its pointed end must have become a moon after separation. Still greater evidence of such flights of fancy on the part of science and scientists can be discovered in their theory of evolution according to which, the scientists say that human being evolved to their present shape from a monkey or an anthropoid or ape. If we were to believe this theory the question arises as to where did the tail of the creature that human being originally was, vanish and how it disappeared. It was then imagined by the scientists that the champanzee which is the nearest relative of the ancestors of the human race) came down from the trees and acquired the habit of sitting and, in the process of sitting the tail got worn out slowly but steadily so much so that eventually it completely vanished. If we were to examine

and question some of the reasoning and solutions advanced by science and scientists, there will be long series of such arguments. But the theory of evolution is about to make its last bow to the scientific world itself. The basic principals of the theory of evolution were conceived out of imagination and the inferences drawn on that basis are tumbling down one after the other. The oldest fossils found from the different parts of the world are no longer the evidence of the theory of evolution.

Dialectical Materialism

Dialectical Materialism is also one of the scientific systems which is opposed to spiritualism. We can call it scientisfic materialism too. Vade vade jayate tatva bodham". According to this principle, the word 'DIALECTICAL' can mean by-synthetical also; but in the present context the meaning of 'Dialectical' is Thesis, antithesis, and synthesis.

Thesis is a statement put forth by a person, the opposition of the same by another then becomes antithesis. If from these two opposite things a third thing is originated it comes to be known as synthesis. The advocate of dilectical materialism would illustrate his principles in the following way:

Thesis: The soul is Material:

Antithesis: The soul is not material, it is an absolutely different substance possessing consciouness.

Synthesis: It is neither material nor a totally different substance. It is a new substance originating by the qualitative transformation of the matter itself. This, then, is the verbal meaning of 'Dialectics'. In the sphere of nature the Dialeches would mean: two inherent contradictory properties of nature developing into a third one.[35] For example the life-destroying element of hydrogen and the life-supporting element of oxygen, combine and produce water. Now, before making a critical study of the above ideas let us examine the very well known three divisions of Scientific Materialism on logical grounds.

Trio of Dialectical Materialism

The ultimate aim of scientific materialism is that the transformation of the universe should be defined dialectically by the properties of the universe istelf. The stages through which that transformation passes are the triple steps of scientific materialism. They are (1) Association of contraries, (2) Qualitiative transformation and (3) Negation of Negation. First the opposite properties meet within the heart of matter. This is association of contraries. This results in the creation of motion which is an essential conditions for transformation. Then a new property is synthesised by the clash of these two just as thesis and antithesis result in Synthesis and

35. Vaigyanik Bhautikvad p. 124.

this is known as qualitative transformation. If now the thesis in this case, is traced back to a previous link, it proves to be an opposing synthesis of some other contraries. And so the qualitative transformation which has now taken place is in opposition to the thesis, it becomes double fold opposition.

Some people believe that HEGEL was the originator of the principle of Dialectical Materialism, and that Marx has only given it an organised form. Be it anything, the theory of dialectical materialism is now linked with only Marx and is considered to be his gift to science. Marx did not restrict the application of his theory of Dialectical Materialism, only upto the soul or the atom; but he applied it to all the main-aspects of life whether they were political, social, cultural or economical. According to the Marxists view-point, this theory has proved its correctness even when applied to those different fields. The Russians have become so crazy after this theory that some of their medical men claim that their method of treatment of diseases is based on the dialectical method. Whatever it be, we have only to conclude on this point, that, 'that due to the qualitative transformation which results from a clash of contrarieties within the matter life (consciousness) originates' and further we have to determine how far this fearless statement of Marxism which in other words is a statement of scientific materialism, comes to be true when tested on the touchstone of realism.

Unity of Opposites

Unity of opposites does not mean only the association of two objects with opposite properties, but according to Marxism, the internal combination of two opposite qualities within the same object is also the unity of opposites. These two opposites may be possessed by the same substance simultaneously. Marxists consider the discovery of this unity of opposites to be a unique and great gift to their philosophy. When questioned by various logicians that two opposite qualities cannot stay within the same substance they justify their own belief by giving practical illustrations. They take shelter under the logic of Hegel and say "the money which is a debt for the borrower is the capital for the money-lender". And again "the road to the east for people living in the west, is at the same time, the road to the west for people living in the east." In advancing further justification for their belief the Marxists borrow some arguments from Plato and say "That the wood of which our chair is made is hard. If it was not hard enough it could not have carried our weight. On the other hand the wood is soft because if it was not soft, an axe could not have cut it. In this way the wood is both hard and soft at the same time."

If we were to accept the aforesaid argument we shall come ot the conclusion that there must be elements of virtue in many vices. It may be that Marx has gone the wrong way in his next step for the deve-

lopment of the principle of qualitative transformation so far as the principle of "unity of opposites" is concerned his reasoning cannot be classed as impracticable. This Marxist principle cannot but remind philosopher about non-absolutism and theory of relativity. Other philosophies may not agree on this point but Jain Philosophy does believe and support the principle of existence of opposite qualities in the same substance, from different angels and points of view. Syadwad—the theory of Relativity of Jain Philosophy —propounds that the qualities of existence and non-exist with reference to others' substance's space, the same time. An object exists with reference to its own substance, space, time and mode and does not exist with reference to other substance-space, time and mode simultaneously. Jain Philosophy answers with the help of Syadwad alone all the deepest problems of philosophy such as the eternal and the non-eternal; one and many; predicable and non-predicable etc. It appears that the illustrations given by the Marxists have been found by them after a long research. But there are plenty of such illustrations to be found in the discussions that took place between the Syadwadins. According to them there does not exist a single thing which is not an example of the co-existence of the unity of opposites. Let us take only a few illustrations. A line is small as well as big. In relation to a big line it is small and in relation to a small line it is big. The same person is the father whereas in relation to his father he is

son as well as the father. In relation to his son he is the father where—as in relation to his father he is the son. In this way we find that the theory of the unity of opposites is not at all new to Indians; nor is it a new invention by Marx. For hundreds and thousands of years Indian philosophers have been probing into this subject with their sharp intellect and intelligence. And now we come to a critical study of 'Qualitative Transformation.

Qualitative Transformation

It was a great mistake on the part of the Dialectical Materialists that they attached to Qualitative transformation the meaning that, 'that which was not, was originated'. They arrived at this conclusion by examining the conditional and natural transformation. But the Indian Philosophers, thousands of years ago, had even further examined and investigated the ever-changing nature of the universe. Jain philosophers had shown that the substance has three characteristics." "Utpad Vyaya Dhraoya Yuktama sat"; in other words a substance is that which is capable of continuous existence through the changes of origination and cessation. In every object there is cessation of old mode, origination of the new mode and permanence of its substance. They said: "Anant dharmatmakam vastu". In other words that, every substance is found to possess innumerable qualities and modes. Amongst them the older ones decay and new ones originate while at the same time the substance is

permanent. For example gold can be made into a pot and a crown and so many other things; but the substance gold within them all is permanent. In the same is the atom. The second substance in the formation way the substantial basic cause of this visible universe of this universe is the soul, the life or the consciousness. It too possess innumerable qualities and modes. It also undergoes the three-fold divisions of origination, decay and permanence but as the soul is the absolute opposite of matter, qualitatively neither matter, Gita also supports the same view in the matter is changed into a soul nor a soul into following words: 'Nasato vidyate bhave, nabhavo vidyate satah'. In other words it means, that 'that which is non-existing will never originate and that which is existing will never be destroyed.' Dialectical Materialists assert that by qualitative and transformation an entirely new property is originated—a property which did not exist in that substance before, in any form or degree. meaning thereby that a non-existent has come to exist. So we come to the conclusion that by the qualitative transformation in matter, the nonexistent the soul (consciousness) has come into existence.

The above argument reacts favourably on the minds of modern youth and they feel that Marx has propounded a novel and wonderfully deep theory. But it does not attract the attention of deep thinkers. According to them they were churning the same sub-

ject for thousands of years before Marx. They say that the Charvaka philosophy of Brahaspati was only given garb of dialectic and the threefold divisions and was, thus, developed into dialectical materialism. Whereas the Lokayatika philosophy traces the origin of soul to the combination of material elements, dialectical materialism traces it to a clash between them. The principle that 'that which does not exist cannot be originated' came to the atheists as a hard nut and dialectical materialism found an unsuccessful way out in the name of qualitative transformation.

To prove the theory of qualitative transformation, in other words the theory of the origination of the existent out of a non-existent, the dialectical materalists, present many illustrations. It will be interesting to study some of them here and go into their critical analysis:

1. Oxygen is a life giving gas which is useful for life while on the other hand hydrogen is a gas destructive for life. But by combining them in certain restricted quantities, water is created—and water is useful for life. This is what is meant by qualitative change or double-fold opposition.

If we deeply analyse the above illustration, it will be evident at the outset, that this illustration does not refer to qualitative change, because in qualitative change, the third property should invariably originate as a combination of two opposite qualities. As is seen in this illustration, oxygen is a life-supporting

element, while on combining hydrogen to it, water originates, which too is life-supporting. In this way it is clear that no third property originates after the combination of oxygen and hydrogen. The property of one element, in the process of this combination or unity, only merges itself into the property of the other element.

On a second thought, even if we were to take it for granted for the time being, that water in itself has a third property, this illustration does not help to prove that the soul originated from the matter. Even according to them, in this case, matter is transformed into matter. Such illustrations could fit in if consciousness was created from matter.

2. Dialectical materialists find the operation of qualitatvie change everywhere. According to them just as sugarcane, sugar etc. are formed out of the earth by the process of qualitative change, in the same way, the mind or the soul is formed out of the matter; and the belief of scientific materialism is centred in the words 'FROM THAT' i.e., from the earth, and not 'THAT' alone or earth itself.[36]

The above illustration also does not clarify the position any better. To say that in the formation of sugar cane, earth alone is the cause and that the seed, the air and the water etc. are nothing as if, is not a correct statement. And if we say that the original substance is atom or in the words of modern science,

36. Vaigyanik Bhautikvad, p. 169.

its many transformations are obvious. If one believes in the stages of transformation from the earth to the sugar, he can also believe in the development of sugar from the earth. According to Indian Philosophy the causes of such a development are the innumerable attributes of a substance and not the origination of non-existant, and this argument is only applicable when it is said that, matter is formed out of matter and not the soul out of matter.

3. In a billiard room the players see that two balls on the table move in opposite directions. If the movement of two balls is not in the opposite directions, they cannot meet. Moving in opposite directions, one ball comes from one direction and the other ball comes from the opposite direction, and when they meet the two opposites meet. When these two balls from opposite directions meet there is a change in their mode. One ball was moving towards the east and the other was moving towards the west. When they meet and clash they change their path and a new direction in their respective movements originates as different from their original easterly or westerly directions. This is an example of the qualitative change of motion.[37]

There might be a decorative usage of words in this illustration but, it appears to be devoid of any sincerity to prove the accepted conclusion. This illustra-

37. Vaigyanik Bhautikvad p. 157.

tion appears to be even more feeble than the previous two. As we see in the first two illustrations, in the production of water or sugar, there was an absolute change in the outward change of matter, while in this present illustration the only change that takes place is the change of direction from one to the other.

Scientific materialists present the doctrine of qualitative change with much gusto to prove their theory. They say that after reaching a particular stage, qualitative change occurs in an even more striking manner and as such it is a law proved by nature itself. The illustrations of these striking changes at advanced stages are, that when being transformed into ice, water does not condense slowly. (i) On the other hand as the temperature falls and reaches the freezing point i.e. 0 degree centigrade or 32 degrees Fehrenhite, water is suddenly transformed into ice.

(ii) When water is heated, as it reaches 210 degree Fehrenhite, it suddenly and all atonce changes into vapour and evaporates.

(iii) A good shopkeeper who is anxious to weigh accurately, puts mow seeds in both the pans one by one to balance the scale. As he puts the last one the scale-beam suddenly becomes straight and if after that he puts even more seed in any of the pans, the beam again gets inclined.

(iv) Four stout athlets wish to pull out a stone. They applied all their energy but failed in uprooting

the stone. Just then a little boy came and he too joined the four stout persons with his little energy. This time the stone got uprooted. This denotes that while the four stout persons were applying their energy the opposing force was just a little in excess and then the little boy added his even little energy, the pulling force of the stone balanced the energy and when these two forces balanced, the stone was pulled out.

Besides the above illustrations, there are many more which can be put forth. The objection of the Indian Philosophers is not with regard to 'change'. The change of the universe at each and every moment is a fact accepted by all. The existence of that law of change we already find in the different limitations of space, time, quantity, similarity and difference etc. It is not, that the change is from the point of view of quantity only. Indian Ayurvedists have proved that honey and ghee, severally are both life-supporting elements. But if they were mixed up in equal quantities the resultant thing will be a poison. I believe that this illustration of qualitative change is more potent than that of oxygen and hydrogen. There the life supporting and life-destroying elements, when combined result in something life-supporting; but here in this case, the two life-supporting elements when combined together in specific quantities, result in a life-destroying element. There is no dirth of such illustrations with Indian thinkers also. The objection of

Indian Philosophers is not based over the natural and associative-dis-associative change. Their objection, rather is, over the emergence of a totally non-existing existant. Let the dialectical materialists continue to assert that qualititative change is that where a non-existing element originates, but the Indian philosophers have discarded this and have proved long ago that all this change is the natural property of a substance which has innumerable characteristics; and that its origination and decay depends upon different view points like space, and time etc. Consciousness has never been the quality possessed by matter and it shall never be so in future too. To talk of the creation of consciousness from matter is equivalent to the creation of an object with form such as a pot, out of a formless void. The form and the form-less-ness, the consciousness and the matter are absolutely opposite things.

Negation of Negation

The third stage of dialectical materialism is the negation of negation. Its definition has been given in the foregoing pages just as we began this subject. This definition, in relation to soul appears to be as invalid as was the definition of qualitative change.

To those who understand the three-fold stages of origination, the decay and the persistence, the three-fold dialectics regarding the question of origin of soul appears to be quite ordinary. It can be believed only as an accepted obstinacy of Marxism to tie up the changes

in society, politics, economics etc., within the limitations of the above said three-fold dialectics. The growing attraction of the modern generation towards Marxism is not due to its metaphysical accuracy but is the result of immediate promises of food and clothing held out to the hungry and the naked man. But the principal illusion that all the metaphysics laid down by this psudo-philosophy which aims at the equal distribution of food and clothes, are also right, is not going to stay for long.

Even the scientists with the aid of the theory of evolution and dialectical materialism, have not been able to reach a final conclusion on the question of soul. In the material world, consciousness has been the mysterious element before and is so even today. But on the subject of the soul the points over which philosophy and science had adhered to entirely opposite views, they have been brought nearer to each other today by the new trends in modern science. And in the words of Sir James Jeans; 'The border land territory between physics and philosophy which used to seem so dull, suddenly became so interesting and important through recent developments of theoritical physics.'

The fact is that, as science was developing and taking pride over its success with childish flippancy, it had to remain astonished at the mystery of nature which confronted it at the close of the last century. Then, during the closing years of the last century,

Prof. Max Planck introduced his 'Quantum Theory' which brought forward a tentative explanation of certain phenomena of radiation which had, till then, completely defied interpretation. His explanation was not only non-mechanical in its nature but also it seemed impossible to connect it with only a mechanical line of thought. It was mainly due to this reason that it was criticised, attacked and even ridiculed. But it proved to be brilliantly successful and ultimately developed into the modern quantum theory, which forms one of the main dominating principles of modern physics. Also, although it was not apparent at the time of its evolution, it marked the end of the mechanical age in science, and opened a new era before it. The second great theory in the field of modern science is the THEORY OF RELATIVITY, of Prof. Einstein. It can be said that this theory has completely altered this trend of science. Challenging the long prevailing beliefs about ether, and the law of gravitation etc. it has advocated to examine the accuracy of each and every fact from a relative view point.

The third and perhaps the most wonderful achievement of science was that of the splitting of the atom. From this, they came to the conclusion that what they considered to be the ultimaate and indivisible particle of matter was in fact composed of electrons and protons, the former rotating around the later like the planets around the sun in the solar system.

When this change in concept came to light, the scientists began to feel that so far science is not in contact with ultimate reality. Not only this, but they started believing that the greatest discovery of the present century was that 'we are not yet in contact with the ultimate reality' and that 'things are not what they seem'.

The truth is, that this turn of events in scientific world completely shattered the pride of the scientists. They came to realise their smallness. They began to think of a colossal knower. In the words of Einstine 'We can know only the relative truth, but absolute truth is known only to the universal observer'. It is now to be seen as to what was the effect of these changes in the original beliefs on the speculation about the soul. Modern science has two aspects—the practical and the theoretical. The subject of soul cannot be the subject of an experimental science. Although, biology—a branch of modern science, has been developed on the basis of experiments, but it should be considered to be another aspect of physiology. In the field of theoretical science the progress made by the scientists is thought provoking indeed! The principal question before the scientists in this field has been 'What is the origin of life.' To this question various answers were put forth, but they all came to the same thing—that life originated accidentally or that it accidentally fell down on this earth from some other cosmic body. But now it is evi-

dently realised by the scientists that 'we are not so much of strangers or introducers as we at first thought. 'They further add, 'so at least we are tempted to conjecture today and yet who knows how many more time the stream of knowledge may turn on itself? What might well have been interlined into every paragraph that everything that has been said and every conclusion that has been tentatively put forward is quite frankly speculative and uncertain." It is clear from the above observations that the scientists are losing faith in their own conclusions. This is evident from what Sir James Jeans observes in concluding portions of his book Physics and Philosophy. 'Many of the former conclusions of the nineteenth century are once again in the melting pot. It is not that some ordinary scientist has started talking about spiritualis m in the materialistic world, but the facts have gone further still.

The thoughts of different scientists on the question of soul:

"I believe that intelligence is manifested throughout all nature."[38]

Prof. Albert Einstein.

"Some thing unknown is doing we do not know what? I regard consciousness as fundamental. I regard matter as derivative from consciousness. . . . The old atheism is gone.

38. Modern Review of Calcutta, July 1936, p. 19-20.

Religion belongs to the realm of the spirit and mind, and cannot be shaken."[39]

—Sir A. S. Eddington.

3. "To-day there is a wide measure of agreement, that the stream of knowledge is heading towards a non-mechanical reality. The Universe begins to look more like a great thought than like a great machine. Mind no longer appears as an accidental intruder into the realm of matter."[40]

—Sir James Jeans.

4. "The teachers and founders of the religion have all taught, and many Philosophers ancient and modern, Western and Eastern, have perceived that this unknown and unknowable is our Very Self."[41]

—Herbert Spencer.

5. "Throughout the world of animal life there are expressions of something akin to the mind in ourselves. There is from Amoeba upwards a stream of inner and subjective life it may be only a slender rill, but sometimes it is a strong current. It includes feeling, imagining, purposing as well. It includes unconscious."[42]

—Sir J. A. Thomson.

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39. Modern Review of Calcutta.
40. Mysterious Universe.
41. First Principles.
42. The great design.

6. "The truth is that, not matter, not forces, not any Physical thing, but mind, personality is the central fact of the Universe."[43]

—J. B. S. Haledane.

7. "A conclusion which suggests.....the possibility of consciousness after death.....the flame is distinct from the log of wood which serves it temporarily as fuel."

—Arthus H. Compton.

8. "The time will assuredly come when these avenues into unknown region will be explored by science. The Universe is more spiritual entity than we thought. The real fact is that we are in the midst of a spiritual world which dominates the material."

—Sir Oliver Lodge.

"The soul of man passes between death and re-birth in this world as he passes through dreams in the night between day and day."

—Sir Oliver Lodge.

"The great design" is a book where the collective opinion of the eminent Scientists of the world is given. In this book, clearly the following thought is given.

"This world is not a machine without soul. It has not come into existence by accident. Behind the veil

43. Modern Review of Calcutta.

of matter, is working a mind and consciousness. This force may be given any nomenclature."

"The suggestion was assiduously conveyed that religion was an outworn superstition, a morbid sentiment, a phase of hysteria, all of which had been exposed by modern science. These misleading and harmful impressions need to be dispelled. The best way of dispelling them is to let science herself speak through the lips of her chief exponents."[44]

"That is old materialistic School—Hecel's school if you like, which, let me tell you, is hopelessly out of date and antiquated."[45]

"And all the theories of matter advanced during the last twenty years are based on a conception, a postulate of non-material. That is the latest science."[46]

"Not very long ago, it was to some extent fashionable in scientific circles to be an Agnostic. But today a man who glories in his ignorance is blamed and lionised. The attitude is quite out of fashion. Thank to the labours of science."[47]

"But to-day unanswerable proof exists that things do happen which appear to be out-side all known Physical class. Such happenings are called

44. Science and Religion, p. 45.
45. Science and Religion, p. 93.
46. Science and Religion, p. 62.
47. Science and Religion, p. 85-86.

by the rather difficult name of Physical, which came from Greek word meaning the Soul. Because such things were formerly supposed to have to do with the soul and not with the body."[48]

"Some authorities who have found satisfaction in the Meteorite—Vehicle—Theory have also suggested that life is as old as matter."[49]

"For no single organic function has yet been found explicable in purely mechanical terms, even such relatively simple processes as the secretion of the tear or the exudation of a drop of sweet continue to elude all attempts at complete explanation in terms of Physics and Chemical Science."[50]

—Prof. W. Mec.Dougall.

"In my opinion there exists but one single principle which sees, hears, feels, loves, things remembers, etc. But this principle requires the aid of various material instruments in order to manifest its respective functions."

—Dr. Gall.

"How did living creatures begin to be upon the earth? In point of science, we do not know."[51]

—J. A. Thomson, M.A.

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48. Children's Newspaper of 8th December, 1923.
48. Evolution p. 70.
50. Psychology, p. 33-34.
51. Introduction to Science, p. 142.

On the basis of the above mentioned observations it can be said without doubt, that in its progressive development on the point of existence of soul, philosophy and science are coming nearer to each other. Science is getting inclined towards philosophy. This union of science and philosophy opens a new era in the history of the world. Where on the one hand in the social set up, there is an indifference towards the spiritual aspects of life, on the other hand the belief regarding rebirth is reaffirmed so much that, it will get its proper place in any type of set up. just in the same manner in which it had been recognised by Indian culture and traditions from time immemorial. Indian philosophers have proved that the ultimate aim of life is to achieve truth, goodness, beauty and salvation. Whether one is a monk or a laymen, his manner of life should be such that it may lead him to the attainment of that goal. With the incorporation of such a decision within science, the Marxist school of thought, which supports only the worldly side of life automatically crumbles down. This does not mean, that the slogan of equality etc. come to an end in this world; or that the economical aspects of life disappear altogether. It only means that man cannot pin up his faith to violence to reach his goal of equality. In the same way, modern politics, modern social organisations and all the other modern isms and counter-isms will necessarily undergo a basic change when they will be measured by the new scales of modern science.

These new conclusions of science will give an opportunity to the intellectuals of today to understand that, the foundations of philosophy were never so feeble as they had thought them to be; that there was an eternal basis of truth and honesty behind what the Indian saints searched, found and enunciated. And without doubt today, this is the universally accepted victory of the soul over the matter, of philosophy over science and of the oriental over the occidental.

CHAPTER 5

ROTATION OF EARTH

"Whether the sun is in motion or the earth?", is a question familiar to all. It arouses curiosity and speculation within us. The purpose of this essay is to give a full account of the various beliefs existing since prehistoric age, regarding this question.

Jain Agamas

As far as the scriptures are concerned, most of them, whether eastern or western, accept that "the earth is at rest while the sun is in motion." In the Jain cannon, Suryapragyaptisutra, we find a clear evidence of the motion of the sun. There Gautamswami, the disciple of Lord Mahavira, asks a question of him,[1] "Lord"! he asked, "The sun starting from the innermost section of the orbit goes to the outermost one; and from the outermost section of the orbit it again goes to the innermost one. How much time the sun takes for this motion?" Lord Mahavir said, "It takes 366 days and nights." The next question is more pointed on the subject of the motion of the sun.[2] "Lord! In how many sections of the orbit the sun moves in the above mentioned time; in how many of them does it pass through once, and in how many of

1. Suryapragyapti Sutra, p. 1|9.
2. Suryapragyapati Sutra, p. 1|10.

does it pass through twice?" asked Gautam Muni. Lord Mahavira said, "On the whole the sun travels in 184 sections, out of which 182 are traversed twice, while the rest two which are the extreme ones, are traversed only once."

In the Vriti of Bhagvati Sutra, it is said, "As the sun proceeds further and further, there is night in the places falling in the rear and day in the places falling in the front. In this way due to space-difference, there is a difference in time of rising and setting of Sun."[3]

In Shri Mandal Prakran, the motion of the sun and the time-difference due to space-difference is made more clear as,[4] "There exists" it is said therein "simultaneously, in one or another of the different places around the mountain Meru, all instances of time beginning from the first minute of the day to the last minute of the night i.e., while it is sunrise at one place in Bharatakhetra, it will be sunset at another place and midday at a place in between the two. In the same way for some, it will be the first quarter of the night, for others it will be the second quarter of the night and for some others it will be the midnight; while for some it will be twilight, all at the same moment."

Vedas

In Atharava Veda it is said, "The sun rotates in

3. Bhagwati Vrith, S. 5, U. 1.
4. Shri Mandala Prakaran Tika.

the sky around the earth." In the same way, in other places in Atharava Veda,[5] the sun's rotation is said to be the cause of the demarcation between day and night,[6] and the earth is said to be motionless;[7] "The sky and the earth are at rest." In Rig Veda[8] it is said, "The earth is at rest" and "The sun travels with its own motion", etc. Thus these scriptures show the immobility of the earth and the mobility of the sun. In Yajur Veda[9] also, the earth is shown as immobile while the sun as mobile. In the literature based on Vedas, such as 'Patanjal Mahabhasya',[10] 'Satpath Brahman,[11] 'Yogadarshan[12] etc., the immobility of the earth and the mobility of the sun is again emphasised. In the same way, Bible and Koran, etc. also support the view, that the earth is at rest. Further, during the age of development of astronomy and mathematics, the astronomers and the mathematicians started thinking about this subject in an analogical manner. There also the well-known mathematicians of ancient India such as Vrahmihir, Bhramagupta, Shridhara Lall, Bhashkara, Mahavira, etc. are of the same opinion. But at the same time, the acharyas like Arya Bhatt, (born 476 A.D.),

5. 13-2-5.
6. 6-89-1.
6. 6-89-1.
7. 10-8-2.
8. 33-43.
9. 14-22.
10. 2-123.
11. 6, ', 2-4.
12. 3-11.

showed that the earth is in motion. This was also the age of support and opposition in India. Those believing in the immobility of the earth, not only established their view but also strongly criticised the opposite view viz., that "The earth is in motion." Shri Vrahamihira (born 505 A.D.) says,[13] "Some people say that the earth is in motion, while the constellations are at rest. If that is so, then how the birds which leave their nests and fly in the skies are able to return to their own nests after a while?"

Shri Lallachaya writes,[14] "If the earth is rotating, how the birds can return to their nests? Why the arrows in the sky do not vanish or do not have non-uniform motion in the East and West? If this is so due to the slow motion of the earth, then how I can complete a revolution within a day and night?" Shripati says, "If the earth was rotating very fast, there would be such a strong wind that things like the buildings, and the peaks of the mountains etc., could not have remained stable and all the flags would have permanently pointed towards the westerly direction." Those believing in the immobility of the earth, also explained the problems raised by their opponents from various points of view, in the same way as they criticized them. One of the arguments, that came before them was as to how earth could be at rest in space without having any support. They

13. Punch-sri A.12. S. 16.
14. Shishyadhee Vridhida Tantra Goladhyaya.

explained this by saying that,[15] "As it is natural for the sun and fire to possess heat; for the moon to possess coolness; for water to possess fluidity; for solid things to possess hardness; for wind to possess motion, in the same way the earth is by its very nature immobile, because the laws of nature are strange."

Jain Acharya Shri Vidyanand Swami, while proving the "Theory of the Rotation of Earth" to be invalid, observes in his well-known book "Tattvarth Shlokavartika,"[16] "The invalidity of the Theory of Rotation of Earth is obvious. It does not require any proof, because every man experiences the immobility of the earth. This experience of the immobility, being identical for all people in all space and time, cannot be classed as a mere illusion. The rotation of earth is not proved by inferences also, because we do not get any extraordinary characteristic. If it is said that although all the stars are steady; day and night occur on earth, and differences in time such as morning and evening, etc. occur and that this in itself is an extraordinary characteristic; it cannot be accepted because this too is also vexed by evidence. If this was accepted, it only proves that because the fire possesses heat, it is material. But then it has to be believed that because of the existence of coolness in water etc., they are also material. The conclusion therefore is that 'heat' as well as 'coolness'

15. Siddhanta Shiromani Goladhyaya S. 5.
16. Tattvartha Shloka Vartika, A. 4.

are proof of materialism." In the same way, by the rotation of Constellations and by the immobility of earth, sunrise and sunset, etc. will occur.

Before the discoveries made by the western world, there was in India, an absolute domination of the believers of the immobility of the earth.

The supporters of "Earth's rotation" could not succeed in providing satisfactory explanations to the arguments against their view, and hence the Theory of the Earth's Rotation could not develop in this country. The supporters of "Earth's immobility" on the other hand could explain satisfactorily all the arguments put to them.

The Western World

In the western world also, as far as the religious books like Bible are concerned, we find the earth to have been fanatically accepted to be at rest. Many of the astronomers and mathematicians also, of which Aristotle and Ptolemy are the most famous ones, supported the same view. In the 16th Century, first of all Copernicus showed the earth to be in motion and the sun to be at rest. And Galilio supported this view by various proofs, as he could view the solar system, for the first time, with his telescope. His revolutionary voice crossed great distances in the western world; but, Pope considered this theory to be a blasphemy. As a result, Galilio had to suffer many calamities from states but his theory was not curbed.

Gradually, all the problems which arose out of the belief that the earth was in motion were resolved. The hypothesis like rotation and revolution of the earth ; the inclination of its axis at 23½, the existence of an atmosphere enveloping the whole earth and the theory of gravitation, etc., fully supported the theory of the earth's motion. Some questions of ancient origin, such as how birds flying in the sky can reach their nests; why all things, on the earth are not destroyed by the tremendous speed of strong winds; why flags etc. do not point to the same direction, were resolved by the presumption of existence of atmosphere. Things like the birds, the arrows, the aeroplanes, which take off from the earth, have a motion of their own; and at the same time being in the atmosphere possess another motion equal to that of the earth, e.g. when a bee is flying in a compartment of a train, it has its own motion of flying here and there in the atmosphere of the compartment ; but at the same time it has another motion also which is equal to the speed of the train. In the same way the arrow thrown out in the space returns to the earth, and the flowing matters like the sea and the river etc., continue to remain on the earth. All these are due to the gravitation of the earth: and the earth remains unsupported in the space due to the gravitation of other planets. Again, another question arose that, if the earth moves uniformly round the sun, how there comes a change in the seasons ? This question is

answered by assuming that the axis of the earth is inclined at an angle of 23½ degrees to the orbit of its motion. This causes the summer solstice and the winter solstice to occur and it is by this process that the seasons are caused. Gradually with the advance of science this hypothesis has become established, so much so that it has been approved by different states and has been included in the school syllabuses. This theory gradually crossed the western boundaries and became well known to the people of the east also.

Miscellaneous Investigation

When the Theory of the Earth's Rotation was being encouraged by the states, the theory of the sun's rotation became the subject of individual investigation. From time to time individual suggestions have been put forth before the public.

In the essay "How round is the earth", written by Mr. Henry Foster and published in 'The Sunday News of India', of the 2nd May, 1948, it has been observed that , "Many people have spent years trying to prove that the earth is flat; but few have revealed such zeal as the late William Edgell of Midsomer Norsten, Somerset. Edgell strove for over 50 years, in order to study the night skies, he never went to bed but slept in a chair. Also he created a still tube in his garden pointing towards the Pole Star which was visible through it. This eccentric man eventually evolved the theory of a flat, basinshaped earth, with the sun moving north and south across it. He con-

tended that the Pole Star was only 5,000 miles away and that the sun was only 10 miles in diameter."

The essay "Is the earth flat ?" written by Mr. Macdonald was published in two parts in Astrological Magazine of July and August 1946. There the writer has tried to prove the theory 'that the earth is round' to be wrong on the basis of scientific evidence. In that essay by assuming the world flat to be like a saucer, other phenomena of the universe have been explained. Since the theme of our present essay is about Earth's Rotation, an extract from the essay of Mr. Macdonald is reproduced here. "The concentric and progressive motion of the Sun over the earth is in every sense practically demonstrable. The earth like all other planets floats in space. The sun moves and is the centre of our (known) universe. The idea that the earth moves on its axis at the rate of 1000 miles an hour is ridiculous." In this way, we find that in India as well as outside, this type of mixed theories have been advanced. Books like P. L. Geography, in which a logical treatment of the subject of earth's rotation has been made, have been written by Indians.

A Critic

In spite of the assumptions made regarding gravitation, and atmosphere, etc., some questions confronted those believing in mobility of the earth and they were questions the answers to which were not

satisfactory, e.g. the Pole Star is seen in the north and it always keeps at the north. According to Indian astrology, the Pole Star is at rest and the earth is also at rest and, therefore it is, that it always keeps at North. It is quite obvious that by assuming the earth to be in motion, the pole star could not be seen at the same place always. When merely by the motion of the earth, the sun, which is static is always seen to be moving from east to west how the Pole Star, standing in the North could be steady ? Modern believers in the earth's rotation explain this by saying that the Pole Star is in the same line as the axis of rotation of the earth. Therefore, it remains in the same position for us and remains uneffected by the easterly and westerly motion of the earth. But this answer is not complete, as the earth is rotating around its axis at a rate of nearly 1000 m.p.h. In 12 hours one part on its surface will be exactly opposite to its position 12 hours before. That means that diametrically it will be displaced by 8000 miles approximately. Then, if we see the Pole Star from the displaced position which is 8000 miles away from its original position, in this age of hairsplitting instruments, it seems impossible that the Pole Star will remain at the same place. Secondly the earth not only rotates about its axis, but also completes an Yearly revolution about the sun moving at a speed of 66,000 m.p.h. In such a circumstance, where he diameter of the sun is 866,000 miles and the circumference of the sun is 2,600,000 miles, and the earth

is rotating in an elliptical orbit at an average distance of 93,000,000 miles, from the sun, how large the displacement of the earth would become within different months of an year, is a mathematically proved fact. In spite of this, for the pole star to remain over the north pole without even a slight change in its position and that it could be observed by us identically throughout the year, is absolutely an impossible proposition. The scientists explain this difficulty by arguing that the Pole Star is at such a great distance from the earth, that it always appears in the same position in spite of the several displacements of the earth. Such an explanation appears to have been advanced, only for the sake of argument; and there seems to be little or no truth in it. Because of the ordinary daily motion of the earth, everyday the sun appears to us to be rising in the east and setting in the west. How can it be understood then, that the Pole Star would remain static in spite of the daily and the yearly motions of the earth?

As has been said before, the scientists have tried to solve many questions by the assumption of the atmosphere, and they say that as the birds and the aeroplanes etc. execute a natural motion together with the atmosphere they can reach back their destinations again. First of all, the assumption of atmosphere is more imaginative than factual. When an atmosphere exists then how it is possible that it does not effect the objects which are moving against

it? Also, it is obviously seen that the birds, the aeroplanes, the arrow and the bullet from the gun etc. move with the same speed in east and west. While on the one hand it is believed that the atmosphere of the earth is so capable that it does not allow anything external to enter into it and ordinarily it does not allow anything internal to leave it; how on the other hand, is it then possible that even a minutely carried out experiment cannot detect its effect on the motions of the earthly matter moving towards and against it. Even if we admit the truth of the scientist's statement that such an atmosphere does exist above the earth, the problem remains unsolved. A bee can execute two motions in the train's compartment, because the compartment is covered from all sides. The compartment encloses a definite volume of air, inside itself and moves piercing the outer atmosphere. But this is not so in the case of the earth's motion. The earth moves in the free surroundings of nature. There is no roof or walls around it. In such a condition, an aeroplane or a bird cannot synchronise its motion with that of the earth viz. daily rotation of 1,000 miles per hour and yearly revolution of 66,000 miles per hour. This becomes more clear when we see that the bee inside the compartment of a train moves with it; but if it flies two to four feet above the roof of the compartment, or on the left or right sides outside the compartment, it will not be able to move with the train. Within a few seconds the train will have gone far ahead of

the bee. In the same way, if a person inside the carriage throws a ball five feet high and wants to catch it again he can catch it. But if the same experiment is carried out by a person sitting on the roof the moving train, he cannot catch the ball again; or if he sets his parrot free from the cage, thinking that it will come back to the cage as it always does, as it is flying within the atmosphere of the train, he will lose his parrot. The conclusion is that the example of the moving compartment cannot support the motion of earth. If the earth were moving, then the birds and aeroplanes moving for hours in the space would certainly be lost.

The general rule of the universe is that a person travelling on a speedily moving vehicle always experiences a resistance from air. If the earth on which we are sitting, is moving like an aeroplane in infinite space why don't we experience any resistance of that sort? We, thus, find that the following argument advanced by Shripati is not at all baseless, "If the earth, our open aeroplane, were moving with the so said tremendous speed, there would be such a terrific shock on its open roof that along with the tall buildings the peaks of the mountains and other big things, we ourselves also would fall down in the space." Also, if there were a gravitational force to stabilize us, we would experience the action and reaction of the atmosphere and the force of gravitation.

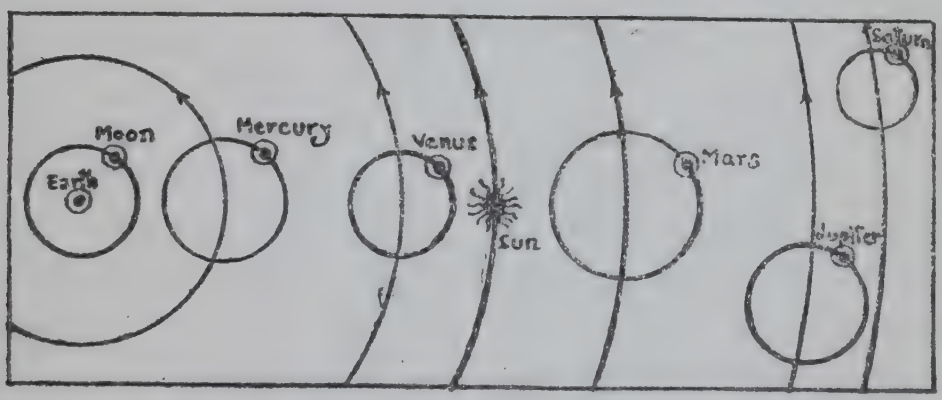
In the New Light of Theory of Relativity

Science is a river in which new ripples con-

tinue to form one after the other. In the first half of the 20th century, the Theory of Relativity was developed and many theories of the scientific world were measured with the new meter of relativity. Newton's Theory of Gravitation, which removed most of the difficulties of the modern geography, could not stand the test of 'relativity'. There was a conflict between 'only' and 'also', regarding the motion of the sun and the earth i.e. whether 'only' the sun is in motion or the earth 'also' is in motion. Einstein put forward a new point of view. He said, "Rest and motion are merely relative.[17] "Nature is such that it is impossible to determine absolute motion by any experiment whatever.[18] The clear view of Theory of Relativity regarding the question 'whether the earth is moving relative to the sun or the sun is moving relative to the earth' is that, "The relative motion of the members of the solar system may be explained on the older geocentric mode and on the other introduced by Copernicus. Both are legitimate and give a correct description of the motion but the Copernicean is for the simpler. Around a fixed earth the sun and the moon describe almost circular paths but the paths of sun's planets and of their satellites are complex curly lines difficult for the mind to grasp and awkward to deal with in calculation; while around a fixed sun the more important paths are almost circular."[19]

17. The Mysterious Universe, p. 79.
18. *Ibid*, p. 78.
19. Relativity and common sense by Danton.

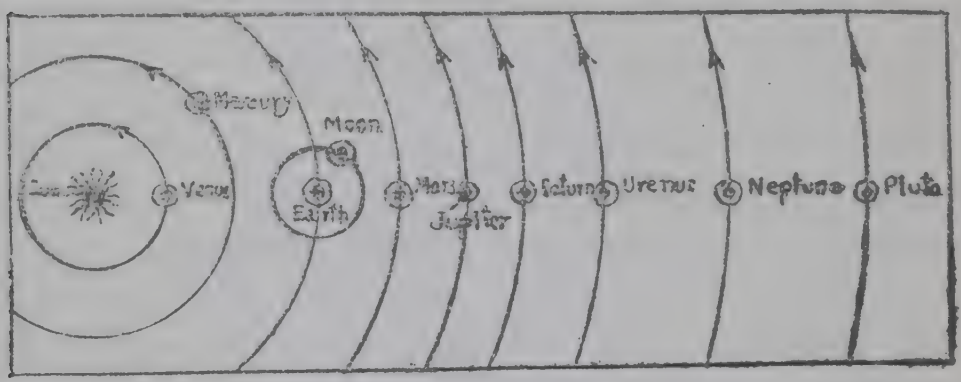
The conclusion, therefore, is that mathematical difficulties arise in assuming the earth to be fixed and the sun to be moving, while there are mathematical conveniences in assuming the sun to be fixed and the earth to be moving. In other words the emphasis on the earth's motion is only for the sake of a mathematical convenience. Those who are interested in mathematics know that there is not much difference in the ancient planetary orbits and the modern planetary orbits. In the Indian and ancient occidental systems, the earth is in the centre, while the moon, the mercury, the venus, the sun, the mars, the jupiter and the saturn rotate round the earth in their respective orbits.



Almost all ancient mathematicians, are of this opinion.

The solar system, in which the sun is in the centre, is like this: The sun in the centre, while the mercury the Venus, the Earth, the Mars, the Jupiter and the Saturn farther away respectively from the Sun. These six are the other planets. The Moon is not a planet

according to modern science. The moon rotates around the Earth ; therefore it is a satellite of the Earth. There are 3 more planets, namely: Uranus Neptune and Pluto.



Today, the question whether; the sun is in motion or the earth is in motion, does not have much importance. Leopold Infeld writes,[20] "A modern phycist, listening to a discussion between supporters of the respective theories of Ptolemy and Copernicus might well be tempted to a sceptical smile. The Theory of Relativity has introduced a new factor into science and revealed a new aspect of deciding between the Copernican view and that of Ptolemy pointless and that in fact the proposition of both of them have lost their significance, whether one says "The earth moves and the sun is at rest" or "the earth is at rest and the sun moves". In either case we are saying something which really conveys nothing. Copernicus's great discovery is today reduced to the modest statement that "in certain cases it is more

20. The world in Modern Science by Leopold Infeld, p. 13.

convenient to relate the motion of heavenly bodies to the solar system."

The history of the above said mathemetical convenience in the words of the famous scientist Sir James is "The history of science provides many instances of situations such as we have been discussing. To begin with the most obvious, Ptolemy and his Arabian successors built up the famous system of cycles and epicycles which enabled them to predict the future positions of the planets.

Many, indeed felt that it was too complex to correspond to the ultimate facts. In the thirteenth century, Alphonso X of Castille is reported to have said that if the heavens were really like that, 'I could have given the Deity good advice, had He consulted me for His creation'. At a later date Copernicus also thought the Ptolemic system too complex to be true and, after years of thought and labour, showed that the planetary motions could be described much more simply if the background of the motions were changed. Ptolemy has assumed a fixed earth; Copernicus substituted a fixed Sun. We now know that the sun can no more be said to be at rest, in any absolute sense, than the earth; it is one of the thousands of millions of stars which together from the galactic system, and it moves round the centre of this system just as the earth moves round the centre of the solar system. And even this centre of the galactic system cannot be said to be at rest, for millions of galactic systems can be seen in the sky, all very much like

our own, and all in motion relative to our own galaxy as also to one another. No one of all these galaxies has a better claim than any other to constitute a standard 'rest' from which the 'motions' of the others can be measured. Nevertheless, many complications are avoided by imagining that the sun and not the earth is at rest. Neither the sun nor the earth is at rest in any absolute sense and yet it is, in a sense, nearer to the truth to say that the earth moves round a fixed sun than to say that the sun moves round a fixed earth.

Copernicus had still to retain a few minor epicycles to make his system agree with the facts of observation. This, as we now know, was the inevitable consequence of his assumption that the planetary orbits were circular. Neither he nor any one else had so far dared to challenge Aristotle's dictum that the planets must necessarily move in circular orbits, because the circle was the only perfect course. As soon as Kepler substituted eclipses for the Copernician circles, epicycles were seen to be unnecessary, and the theory of planetary motions assumed an exceedingly simple form—the form it was to retain for more than three centuries until an even greater simplicity was imparted to it by the relativity theory of Einstein, to which we shall come in a moment."

From the above mentioned link between the east and the west we come to the conclusion that their main purpose is not to find whether the earth is in

motion or the sun; but to find the basic formulae about the natural principles regarding the positions of the planets. Einstein's age has put Scientist, who believed that only the earth is in motion, a step backward. Its result was that by assuming the sun to be the nucleus, we only got mathmetical convenience. The truth regarding inability and immobility is still unrevealed.

CHAPTER 6

'EARTH'—A MYSTERY

The earth has always remained a mystery to the human mind. When was it originated? When will it be destroyed; and how is it maintained now etc are the questions which the man has tried to answer. More is his knowledge widened, the more ridiculous appear his former imaginations. But he never has an idea that whatever he thinks today will also become one of the link of this chain of ridiculous thoughts, in a distant future. What unbelievable thoughts the people had in the past as well as what strange imaginations the science has today, regarding the above questions constitute an interesting subject which ought to be studied. [1]"The ancient Hindus believed that the earth is the work of God and it is supported by a huge cobra known as Seshnaga. The ancient Greeks believed that the earth is similar to a very large, flat roof supported by 12 pillars, known as "pillars of Hercules". There is also a belief that a giant called Atlas carries the earth on account of a curse. According to the ancient jews, the earth is the bottom of an elliptical universe."

1. Hindi Vishwa Bharati, part 1, p. 28.

There were various beliefs regarding the shape of earth[2] "some believed the earth to be cylindrical, while some regarded it as a six-sided parallelopiped; some believed it to be spherical like melon, while others considered it to be betal leaf shaped. Columbus tried to prove that it is conch-shaped."

In modern science, the speculations about the creation and the maintenance of the earth are found to be even more fantastic. The scientists say[3] "We believe, nevertheless, that some thousand million years ago this rare event took place, and that a second star, wandering blindly through space, happened to come within hailing distances of the sun. Just as the sun and the moon raise tides on the earth, so this second star must have raised tides on the surface of the sun. But they would be very different from the puny tides which the small mass of the moon raises in our oceans; a huge tidal wave must have travelled over the surface of the sun ultimately forming a mountain of prodigious height which would rise ever higher and higher as the cause of the disturbance came nearer and nearer. And, before the second star began to recede, tidal pull had become so powerful that this mountain was torn to pieces and threw off small fragments of itself such as the crest of a wave throws off spray. These small fragments have been circulating around their parent—sun ever-since. They are the planets, great and small, of which our earth is one."

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2. *Ibid.* p. 31.
3. The mysterious Universe.

This is the scientific opinion about the creation of the earth. Further it is shown that at the time of separation from the sun, the earth was not like an orange, but it was somewhat pointed like a pear. During its fast rotation this pointed portion was detached from the earth and it continued to rotate about the earth. This is the Moon, which is as familiar to us as the Sun. But according to the most modern science, the history of rotatio ndoes not end here. The moon rotates round the earth, and the earth together with the moon, rotates round the sun. But the sun itself is not stationary. The Sun together with the planets like the earth also rotates round some other larger planet, and this planet round another one and so on. At the time of creation, the temperature of the earth was so high that the whole of it was gaseous. Gradually that ball of gases became colder and solidified. A time was reached when relatively more solidified internal portion started to depart from the external lighter and less solidified portion. As the time passed, the internal portion became more and more soldified while the outer cover was rarified into an envelope which can be called a predecessor of the present atmosphere. That external envelope or atmosphere first remained like a thick fog, through which the rays of the sun could not pass, but gradually the rays piercing its vapour-envelope reached the internal sphere. By the entrance of the rays and their continuous contact, clouds were formed and conditions of monsoon were

created. The rains due to this monsoons can only be compared with those at the time of deluge. This condition also did not last for a long time. Gradually when the temperature of the earth became normal plants started to grow on the earth. After the plants came the reptiles. Gradually the evolution of life continued and when the advanced type of monkeys called Chimpanzee had become habituated to sit on the ground instead of on the trees, a new creature called man was born in their generation.

Nor has the science kept mum about the future. It foretells that gradually, the speed of rotation is decreasing. At present the speed is one rotation in 24 hours; but in the past, it had the speed of one rotation in 3 or 4 hours. At that time, the day and night each consisted of 2 hours. In future the speed will decrease to one rotation in 1400 hours, i.e. the day and the night each will be of 700 hours. Further on, the speed will become less than even this. Together with the speed, the temperature will also go on decreasing. And as, in the beginning on account of tremendous high temperature there was no life possible on the earth, later on due to tremendous cold every creature will be frozen to death. It will even happen that the whole earth completely destroyed forming into atoms, may vanish into Nothing.

The above mentioned speculations about the creation and destruction of the earth, are some of the

most modern ones in the scientific world. Although various other imaginations had occurred in the minds of the scientists even before this, they were not systematic. Having known the ancient beliefs such as the earth is supported on the head of the cobra (Seshnaga) as well as the scientific beliefs such as the earth is a piece of the Sun, the moon is the piece of the earth etc., the thinker (the reader) will definitely find that the opinion of the Jain Scripture and the Jain Philosophy about the creation and the destruction of the earth is more logical and rational. Here, it is believed that our earth (known as 'Tiryaglok'), is one of the many earths of the universe. There are various different earths, in the infinite space above our earth, as well below our earth. They are called Urdhvaloka and Adholoka respectively. In this way, this universe is 14 rajjus in height. It is indistructible and its earth, consisting of countless oceans and countless lands is also a permanent feature. The meaning is that this earth was never created nor will it be ever completely destructed; it is neither detached from the sun nor the moon is detached from it. Monkeys and men are and have always been the residents of the earth. Where, in the philosophical world, there is a view that the earth was created by the God, the solution by assuming the earth as without beginning and end is more correct, because, if we asked the believers of God as a creator, the question that if this earth was created by somebody, when, why and how it was created, they keep mum. This argument can be car-

ried so far that in the end such insoluble problems as regressus ad infinitum (Anavastha dosa) material cause (Upadan), and reduction to nothingness (Hani) etc. would arise. In the scientific age, the view of the God as creator has little weight. "The matter is transmutable by itself" is proved to be a fact. The sun, the moon, the stars, the earth etc. are created and destroyed by natural changes. Their material cause, the matter itself is indestructible. The science also would have believed the objects of the nature, like earth etc. as permanent in their shape etc., but, for the problem facing them that how any object composed of atoms can remain permanent? Construction and destruction are normal activities of the nature. The view of Jainism can solve even this problem. It believes, that even though the construction and destruction are the inherent properties of the atoms, which are the substantial (Upadan) cause, of the material world, there are certain representatives of physical world, which inspite of keeping the same shape, undergo the destruction and construction. In other words, these reactions take place in them internally according to natural laws. The constituent atoms of these entities in the state of destruction become more and more apart from one another at every moment and the atoms in the state of construction go an adding to these entities. After a considerable lapse of time all the original atoms of the entity (Samsthan), one by one, would be replaced by new ones, but in outward appearance,

the entity would be found unchanged. This work of nature can be explained more clearly by taking an instance of a building or a village. The owner of a building and his successors, go on replacing the damaged parts of the building. In future one day will come when the original building would have been replaced by new parts, but from the point of view of people, it is the same building, which was built hundreds of years ago. But the chain of heredity is not endless and the human energy is limited; otherwise this building also would have been a permanent object (Samsthan), of the physical universe. The nature on the other hand is permanent (endless) and it has no weakness. It never runs out of substance. Therefore, whatever entities it wants to keep permanent do remain so. Another example is of a village. A village or a city is the collection of people and houses. After a century and some more years, all the residents (dwellers) of the village would be changed and after thousand years, the houses too. But it is known as the same village. Even today we find many such cities, whose continuous history of 1,000 years is found found. It is also probable that there may be cities, whose names, culture, size (area), might have changed nevertheless their geographical (Sthanik) and collective (Samudayik) existences might have its beginning with that of the human races. We may not recognise them as they were, but in the realm of nature it is not impossible. This work of nature is intellectually perceptible (Budhigamya). In the same

way, just as the citizens are born and die while the city (or village) remains permanent, in the above mentioned physical entities the atoms are also added and reduced according to the natural rules while the substantial bodies remain permanent. Some of such natural entities are the solar system such as the sun, the moon, etc. and many other earths (one of which is our earth), and also some oceans and some mountains, resting on them. The Jain philosophy has given the above view regarding the creation and the maintenance of the earth, thousands of years ago and it is ahead of all other philosophical and Scientific beliefs. However, a question always remains in the vicinity of a conclusion. Nevertheless it seems that a rational man may reach nearer to the truth about the present problem by this way of approach.

Origination and Extinction

The speculations which are made by archoeological of the earth, which are based on evidences obtained from the chemical processes taking place in mountains, mines and under the surface of the earth, are in some ways identical to those, which are arrived at by the Jain-physics, in terms of "Avasarpini and Utsarpini time-circle. Avasarpini and Utsarpini mean two semi-circles of a very large time-wheel of generation and evolution respectively. (Kalachakra). During the half of the time-circle the Utsarpini, all processes on the earth gradually undergo evolution, and during the other half,

the Avasarpini, they undergo gradual degeneration. Towards the end of the present Avasarpini the following is predicted to happen by Jain scriptures. "At[1] that time, on account of extreme miseries, there will be untold suffering amongst the people. There will be strong dust-raising winds. It will be unbearable and will create panic. There will be whirl winds by which the dust etc. will be collected at places. Due to frequent dustfall all the ten directions will be filled with the dust particles. On account of the darkness thus created, it will be difficult to see. Due to hard time, the moon shall become more cold and the sun more hot, and it will rain frequently. These rains will be inspid, salty and poisonous. They will be accompanied by with terrible lightening, unpleasant clouds with strong destructive winds. By these rains the human beings, the animals, the birds and also the trees like mango, jonesia, asoka etc., existing in the villages, towns, cities and ashramas etc. of Bharatksetra will be destroyed. All the mountains except Vaitadya mountain and all the rivers except Ganga and Sindhu, will be destroyed. At that time the earth of Bharatksetra will become scorched, crushed and reduced to ashes. The creatures residing on the earth will have great troubles. At that time people of Bharatksetra will have unpleasant colour, smell, taste and touch and will speak unpleasant and disliking words; and their

1. Bhagwati Shatak 7, u, 6.

gait will be crooked like that of a camel; they will possess unsymmetrical joints of the body; they will appear ugly due to unsymmetrical ribs and bones. The maximum height will be one foot, and life span will be 20 years. The river Ganga and Sindhu will only be as broad as the path of a cart. There will be plenty of fish-like water-creatures. Water will be scarce. There will be a few human being remaining like seeds. They will stay only on both sides of the river bank. They will come out of their burrows, only one muhurt (48 minutes), before the sunrise and one muhurt after the sunset and will cook the fish etc., in the hot sand and eat them. This type of situation will last for 21000 years.[2] This is the last moment of degenerations, after which the other half wheel i.e. utsarpini will commence from the beginning, the situation will improve again. Gradually pure winds will smooth rain will fall, and there will be favourable temperature. The human beings residing in burrows and other protected places will again come out from there and move about in the free atmosphere of the earth. The population will increase; the villages and cities will be reconstructed; and till the last days of utsarpini, the whole atmosphere of earth reaches the peak of evolution. In this way one time-wheel is completed." Here it is also to be understod that this time-wheel does not affect other places of the universe as ours.

2. Janubdipapragyapti—Kaladhikara.

This kind of change taking place in nature is known as 'creation' and 'deluge' by the people. According to Jainism, 'deluge' does not mean "complete annihilation"; it is the farthest limit of the degeneration.

It is quite probable that the changes taking place on the surface of the earth in the form of the evolution and degeneration, and also under the surface the earth are the means of speculations of the modern science regarding the creation and destruction of the earth. In the end we can say that Jain-physics can be helpful to the new thoughts for solving the mystery of the earth's processes and also about the evolution of life. Hence it is desirable that the geologists and other authorities should pay more attention to this.

CHAPTER 7

DHARMA AND ETHER

The ancient Jain thinkers had conceived the existence of a substance which they called DHARMA, in the form of a passive medium of motion for souls and atoms (i.e. matter). Thousands of years later, nearly 200 years ago, the scientists also conceived the existence of 'ether' to explain the theory of motion. Both, the 'Dharma' and the 'ether' inspite of being the mediums of motion were different from each other regarding the very definition of their nature. How the ether hypothesised by the advancing modern science, can be identified with the ancient Substance Dharma of the philosophical system, is the subject of this essay. Dharma substance is known as Dharma.

The Dharma Element

Lord Mahavira, elucidating the nature of the or Dharmastikaya in the Jain Scriptures.
universe said,[1] "The universe is composed of six substances, viz., The Adharma, The Space, The Time, The Matter and The Soul. Another question was, "What is a substance? Defining the substance he gave the answer,[2] "The aggregate of 'the attributes is a substance". Hence, it is clear that the word 'Dharma'

1. Uttradhyayan Sutra 28.7.
2. *Ibid,* 28.6.

is used here neither in the sense of religion, which is defined as the[3] "means of purifying the soul" nor in the sense of 'duty' nor again in the sense of an attribute or property. There, it is a technical word signifying an independant substance existing in the universe. In the words of Lord Mahavira, the chief characteristic of 'the Dharma' are:-

"Dharma[4] is a single indivisible entity which pervades the whole of inhabited universe. It is eternal. It is colourless, odourless, tasteless and touch less, it helps the motion of the souls and the matter". "Dharmastikaya[5] is a colourless, odourless, tasteless, touchless, invisible, inanimate, eternal, immobile, and universal substance." "By[6] the help of Dharmastikaya, the activities of the soul, such as moving, speaking, twinkling of eyes, activities of mind, speech and body etc., and many other kind of motion, take place." [7]"Dharmastikaya is composed of countless (pradesh) points and all of them are complete, whole and uniquely defined."

We have said that 'Dharma' is composed of count less points (pradeshas). The meaning of pradesha or a point should be made clear.[8] The minutest ((indivisible) undetached portion of a substance is

3. Shri Jain Sidhanta Dipika—7.23.
4. Bhagwati Sutra—S. 2.U.10.
5. *Ibid.*
6. Ibid S. 13.U.4.
7. Ibid, S. 2.U.10.
8. Shri Jain Sidhanta Dipika—1.22.23.

called a 'pradesha'. In otherwords, a portion of the undivided Dharmadravya which is equal to a Paramanu (matter point) is called a 'pradesh'. All these pradeshas integrate together, to form (a homogeneous substance) "Dharmastikaya".

Why Dharma Dravya?

After Lord Mahavira, other Jain philosophers have amply proved the existence and utility of 'Dharma'.[9] Acharya Shri Tulsi writes in 'Jain Sidhanta Dipika':—

"The states of motion and rest of souls and matter cannot exist without the assistance of Dharmastikaya and Adharmastikaya. If this function of assisting the motion is attributed to any other material substance such as air, then we would have **"regressus ad infinitum"**. Hence the existence of Dharmastikaya is undoubtedly proved. Dharmastikaya and Adharmastikaya do not exist in uninhabited universe (Aloka). Therefore, the souls and matter are neither able to go there nor able to stay there.

Acharya Malyagiri showing the significance of Dharmadrvya writes in the Vritti of Pannavana, and Vinaya Vijayagani in Lokaprakash[10] "In the absence of Dharma and Adharma there can be no systematic

9. Shri Jain Sidhanta Dipika—1-5.
10 (a) Pannawana Sutra Vritti Pad 1.
(b) Loka Prakash—2-20.

division like inhabited and unihabited universe.

Shri Prabha chandra suri explaining in detail the Dharmadravya in his Prameys Kamal Martanda writes that :-

"The motions of all souls and material substances require an external medium (Nimitta) because all of them are found to be in motion simultaneously, just as by observing the simultaneous motion of many fishes it is inferred that water of the same lake is the medium of motions."

Existence Proved by Reasoning

The concept of Dharmastikaya is not entirely hypothetical or baseless. This point is fully clarified by Jain philosphers.

Jainism believes- "The space is infinite, the (inhabited) universe is finite, existing in a part of the space." The reason for the above belief is, that in the universe there must be some substance, the attribute of which, is to assist the motion and that substance is limited to the inhabited universe. If it were not so, each and every atom of the universe would have scattered in the infinite, as a result of which, there would have been no integration (as systematic intergration is now observed). This is logical reasoning for the existence of Dharmadravya.

Another reasoning is that, the soul and matter are two mobile substances. The substantial cause

of their motion is they themselves but the immediate cause is to be searched. The land, the water etc, are not pervading the entire universe while the motion exists throughout the universe. The air etc., are themselves mobile. The space pervades not only the inhabited universe but also the uninhabited universe, but the motion of the sould and matter seem to be confined to inhabiteed universe only. The time is independent of motion and pervades only a part of universe. Not a single one of the known substances can thus be, a medium of motion. Hence, the concept of an independent Dharmadravya is absolutely natural and reasonable.

The Nature Of Assistance given by Dharmastikaya

Shri Kundakundacharya, describing how Dharmadravya assists the souls and matter in their motions, writes in Panchastikayasara "Dharmastikaya' neither moves by itself nor creates motion in other things but its function is to act as the substitute of motion of soul and matter. "Exactly as water is passive to the movement of fishes so, the Dharmadravya itself immobile is the 'sinqua non' of motion of souls and matter.

Sindhanta Chakravarti Shri Nemichandra suri writes "As water helps the movement of moving fish, so does the medium Dharmadravya help the motion of matter and soul. But it does not 'inspire' the stationary bodies to move."

Amrit Chandra Suri writes, "Dharma is the

medium, which helps the motion of things which are active and in motion. Just as water assists the fish in its movements, so does the Dharma help soul and matter when they begin to move by themselves."

We can illustrate the function of Dharmadravya in terms of modern equipment by citing the railway tracks. Just as for the motion of the trains, the existence of tracks is absolutely necessary, so, for the motion of mobile souls and matter, is the existence of Dharmadravya absolutely necessary. The tracks do not inspire the train to move, but they give passive assistance in the motion of the train. Same is the relation of Dharmadravya to the motion of the soul and matter.

And now brief definition of Dharmadravya can be given thus.-

'Dharmadravya is one whole indivisible substance, pervading the entire inhabited universe. It is composed of countless pradeshas (points). It is a passive substitute of motion. It is colourless, odourless, tasteless, touchless, formless, unatomic, (non-corporeal) and non-material.

Ether

Ether had no standing in science prior to 19th century. The attention of scientists was not drawn to-wards the subject uptill then. But how can it be possible, that the people who have thought about each and every aspect of universe, would remain

ignorant about such an important one. When the problems such as, 'How can the light (from the sun, the stars or the planets and other cosmic bodies) traverse throuh the vacuum. They believed that, without a medium, the light which has weight cannot travel from one place to another. This problem forced the scientists to search for some medium of motion as a result of which, the concept of 'Ether' was evoloved. It is believed that, the ether is not only present in the vacuum space between the stars, planets and other cosmic bodies, but also in the inter-space inside the tiny atoms.

In the earlier speculations about ether, it was also believed that, the ether is not a non-material but a material substance. That it possesses a definite type and amount of elasticity and density. The amount of elasticity and density was also estimated, but it was doubtful. And on account of various other problems, the attention of the scholars was not attracted towards that point.

The following illustration will help to understand the function of ether:-

A boat arrives at the landing stage in a river and is made fast. The boatman drawing their cars, and keep them in such a way that their ends are hanging out from the edge of the boat. Drops of water are falling down from the oars. Every drop which falls produce a circle (in the water) the

circumference of which goes on increasing. As one drop follows another, so , also one circle does another. They are all concentric circles increasing progressively. There is a definite relation in the increase because their motion is identical. An now, the boat is released but, the oars are not in use, yet. The boatman uses a long pole to get the boat into the stream. The water still continues to drop from the oars but now the drops do not fall at the same place. And hence, the circles are no longer concentric but move forward. The scientists said that, just as the position of the boat has no influence on the velocity of the light. The ray of light would continue to travel at the rate of 186000 miles per second. A question now arises that, ,just as the velocity of the motion of circle in the water is diminished (due to the resistance of water) does the ether not resist the motion of light rays? But the tests proved, that the velocity of light was constant whether it came from far or near. It does not happen that the light coming from a source only a million miles away is travelling faster than the light coming from a source thousands of light years away. Why is this? To this their reply was that the resistance of ether was so small that it had no appreciable influence on the velocity of light. For all practical purposes, the resistance is zero and the velocity of even, the cosmic bodies floating in the ether is not affected by its appearance. Now, it is illogical to conceive that, ether is material, possessing elasticity, density and

fluidity and yet, it has no effect on the motions of the cosmic bodies. Notwithstanding this flaw, the scientists were so eager to establish the existence of a medium for the motion that, they could not abandon the conception of the ether. Whereever, necessity for a medium arose, they conceived another with special properties to suit the conditions, so much so that they conceived a special ether which assists the travelling of messages from one part of the body to another. In other words, the number of (various) ethers which could harmonise the logical reasoning with the problems, mounted up to hundreds. Inspite of this the conception of ether is considered to be, the greatest contribution of the science in the nineteenth century.

The ether, upto this time, was similar to the Dharma Dravya of Jain philosophy, only in that they both were mediums of motion. But from other points of view, on account of the difference in their material and nonmaterial nature, they were quite opposite to each other. Whereas Dharma Dravya was believed to be a non-material medium which cannot be conceived to possess colour, odour, taste or touch as also its, fluidity, density elasticity and rigidity, etc., the ether was quite opposite to it. But further investigation in the 20th century brought about a revolution in the conception of Ether. The latest characteristics of ether are given by the Einstein's Theory of Relativity'.

According to this, the ether is a continuous, indivisible substance which is non-material (non-atomic) and pervades the whole universe and is invisible.

A few authoritative quotations of scientists will give enough material to understand the historical development of the theory of ether and the outline of the characteristic of modern ether. Dempiyar writes on page 3 in his book 'A short History of Science', "Different scientists have used the Greek conception about ether in different ways. With its help, Kepler tried to establish how the sun keeps the planets moving. Descrates considered the matter, as ether for the formation vortices. Gilbert used ether in the establishment of the Theory of Electricity and Magnetism. Harvey had the confidence that only by the help of ether the light from the sun reaches to the living beings and to the blook". He writes further on page 164. [16]Formerly the scientists believed that light does not possess weight but in this age, they have accepted the view that light possesses mass, which was accepted by Jain philosophy eternally."

"For the propagation of waves, a medium was necessary and consequently the existence of ether was conceived. For the transverse motion of waves,

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11. Dravya Sangrah Sanskrit Chhaya.
12. Tattwarth Sar A.7.

it was necessary that the ether possesses rigidity. Many theories were put forth to prove the concept of ether as a solid substance, possessing rigidity. But all these theories had to face this question—If the ether is a solid possessing rigidity, how can the planets rotate in the space without encountering any resistence. But, when Maxwell proved that light waves are electro-magnetic in nature, the concept of solid ether vanished."

The first problem was, of course, that if light-waves were real waves, they must be waves in something. They were plainly not waves in matter. It was necessary, therefore, to invent something else, which was not matter, for them, to be waves in. This something they called the 'ether', and imagined it as an utterly thin and utterly elastic fluid, that flowed undisturbed between the particles of the material universe and filled all 'empty space' of every kind.

What was this 'ether' like? Difficulties and contradictions appeared at once, for it was proved to be (1) thinner than the thinnest gas (2) more rigid than steel (3) absolutely the same everywhere (4) absolutely weightless, (5) in the neighbourhood of any electron immensely heavier than lead.

The Newtonian Ether is rigid, yet, allows all matters to move about in it, without friction or resistance, it is elastic but cannot be distorted, it moves but its motion cannot be detected, it exerts force on matter

but matter exerts no force on it, it has no mass nor has it any parts which can be identified, it is said to be at rest relatively to the 'fixed stars' yet, the stars are known to be in motion relatively to one another.

A hundred years ago, the ether was regarded as one elastic body, something like a jelly but, much stiffer and lighter so that it could vibrate with extreme rapidity. But a great many phenomenon culminating in the Michelson experiment and the Theory of Relativity showed that the ether must be something very different from ordinary terrestrial substances.

Experimentns Concerning Ether

The question arises that, why, were there so many different speculations about the ether and why so many different conclusions have been drawn? Are all these conclusions based on mere imaginations or some experimental proofs? From time to time, various experiments have been conducted to understand the nature of ether. The most ingeneous and prominent of all these experiments, is the one, performed by Michelson & Morley nearly one hundred years ago, in the laboratories of Cleveland University of East Ohio.

The basis of the experiment was that, all material bodies are really floating about in a limitless ocean of ether, it is quite easy to find how fast they are moving through it. The following analogy will make the point clear. The time taken to row a boat a certain distance up a swift river and down again is always

greater than the time taken to row the same distance across the river and back. This can be proved mathematically. Even if the water were invisible one could calculate how fast it was flowing by measuring the time either way. In the same way it was argued that if earth were really moving through ether, a ray of light would take a longer time to go to a mirror and return a certain distance along the earth's motion than across it. If ether were a material medium for the earth to move through, this conclusion is inevitable. The experiment was performed in America by means of the most delicate apparatus, and to the great disappointment of the workers, it was found that both journeys of the ray of light took exactly the same time. In the words of Richard Hughes, 'It showed that to try seriously to find out facts about the ether as if it were a real thing would be almost as absurd as to try and find-out what the 'Good Shepherd's Crook' is made of!

This was first performed in 1881, and it was repeated with more precautions in 1905. The result was published in the Proceedings of the 'American Academy of Arts and Sciences', the result again being zero. During the period 1921-25, a series of more exhaustive and elaborate experiments were carried out by Prof. D. Miller on Mount Wilson, California. Five thousand observations were recorded for full periods of 24 hours and extending over ten days. The conclusion was that there was a relative motion of the earth and the ether.

This result produced a great commotion in the scientific world. For Michelson-Morley experiment had led us to conclude that either there was no substance as material ether or that it moved with the earth or that it remained inert and at rest in the space, while Miller's work indicated ether's existence and proved ether to be not non-existent.

More delicate experiments were taken up in Germany in the year 1925 by Tomaschek to detect the motion reported by Miller. The work of Tomaschek was again criticised by Chose in America and he carried out his experiments which were published in the Physical Review, August 1926, "No such motion could be detected." The Michelson experiment has been again repeated in recent years in a free balloon at heights of nearly 1½ and 3 miles but the authors report that they are unable to confirm or refute Miller's report. The Miller's results for some reasons are proved to be inaccurate by the research of Kennedy in U.S.A. published in November 1926. The famous "Chicago Rotation Experiment" designed to test the effect of the earth's rotation on the velocity of light confirmed the view that ether was static and not moving. Thus, many experiments were performed to detect the motion of ether but the conclusion of all of them was that ether is static and not moving D. C. Miller in his paper "Ether-drift experiment and determination of the absolute motion of the earth" read before the British Association, Leicester, in Sep-

tember 1933, and published in the "Nature" February 3, 1934, says:

"The magnitude and direction of the observed effect vary in the manner required by the assumption that the earth is moving through a fixed ether." The fact of the matter is that the Scientists find themselves on the horns of a dilemma regarding this mysterious ether. The Scientists can neither accept it in the form conceived nor can they give it up altogether. However, ether seem to coincide gradually with the Dharma Dravya defined in Jain philosophy—the element, which is devoid of the material properties like colour, odour, taste and touch, which is formless all pervading and possessing countless 'Pradesha'. But, on account of the fundamental prejudices, the Scientists are hesitating to call such an element a real existent. At the same time there is no other way out of it but to accept it as an existent. The famous Scientist Sir James Jeans writes in the Chapter of 'Relativity and the Ether', in his book 'Mysterious Universe', with an explanation of the Rada Lecture delivered before the University of Cambridge in November 1930, "The ether in its various forms of energy dominates modern physics, though many prefer to avoid the term" "ether" because of its nineteenth-century association, and use the term "space". The term used does not matter much. I think, the best way of regarding the ether is as a frame work of reference. Its existence is just as real, and just as

unreal, as that of the equator, or the north, pole, or the meridian of Greenwich. It is a creation of thought not of solid substance. We have seen how the ether, which is the same for all of us, as distinguished from your ether or my ether, must be supposed to pervade all times as well as all space, no valid distinction can be drawn between its occupancy of time and space. The framework of time to which we must compare the time dimension of the ether, is of course ready to hand it, is the division of the day into hours, minutes and seconds. And unless we think of this division as material, which no one ever does or has done, we are not justified in thinking of the ether as material. In the new light which the theory of relativity has cast over Science, we see that a material ether filling space could only be accompanied by a material ether filling time—the two stand or fall together.

In the beginning of the chapter he clarifies the subject further. "It may be well to state our conclusion in advance. It is, in brief, that the ethers and their undulations, the waves which form the universe, are in all probability fectitious. This is not to say that they have no existence at all, they exist in our minds, or we should not be discussing them, and something must exist outside our minds to put this or any other concept into our minds. To this something we may temporarily assign the name "reality" and it is this reality which is the object of Science to study. But we shall find that this reality is something very different from what the Scientist of fifty years ago

meant by ether, undulations and waves, so much so that, judged by his standards and speaking his language for a moment, the ethers and their waves are not realities at all? And yet they are the most real things of which we have any knowledge or experience, and so, are real as anything possibly can be for us."

Those, possessing a detailed knowledge about the Dharma Dravya can easily grasp that, how speedily the Scientists are nearing the concept of 'Dharma Dravya', as defined in Jain Scriptures, after passing through a long zigzag chain of imaginations and hypothesis.

Although the long existing conceptions prevent from accepting such a non-material element, the reality of nature attracts them more and more towards it.

The following authorative quotations will further elucidate that Dharma Dravya and either are indentical to each other. Sir Eddington writes in his well-known book "The nature of the physical world."

"This does not mean that the ether is abolished we need an ether. . . . In the last century it was widely believed that ether was a kind of matter, having properties such as mass, rigidity, motion like ordinary matter. It would be difficult to say when this view died out. . . . Nowadays it is agreed that ether is not a kind of matter. Being non-material, its properties are Suigeneries (quite unique) characters such as mass and rigidity which we meet with, in

matter, will naturally be absent in ether but the ether will have new and definite characters of its own . . . non-material ocean of ether."

Prof. G. R. Jain, M.Sc. comparing the Dharma Dravya and ether writes in his book 'Cosmology old and new' "Thus it is proved that Science and Jain physics agree absolutely in so far as they call Dharma (Ether) non-material, non-atomic, non-discrete, continuous, co-extensive with space, indivisible and as a necessary medium for motion and one which does not itself move."

The most famous mathematician Prof. Albert Einstein drawing a line of demarcation between the inhabited universe and the uninhabited universe writes "The universe is limited, while the non-universe is unlimited. Due to limitedness of the universe, matter or energy cannot go out from it outside the universe, the element which is a medium of motion does not exist."

The reader can easily notice the striking similarity between the views of Einstein and Jain philosophy regarding the Dharma Dravya—the medium of motion. Hence, it will not be an exaggeration if we make a broad statement that Dharma-Dravya is nothing but Dharma-Dravya.

A Concluding View

This comparative discussion about Dharma-Dravya and Ether brightly elucidates the various

relations between Science and Philosophy and brings a revolutionary change in the existing concepts about the same. It extinguishes the belief that Science is everything while philosophy is nothing—that philosophy is a nonsense created by the undeveloped brains of the primitive generation. It clarifies the fact that—with what a great authenticity the philosophers have expounded this subtle element of the universe, thousands of years ago, when the seeds of the Science were not even sown. Even today Science is just staggering on the ladder of knowledge to reach that stage.

On the other hand, those who have the belief that Science is nothing, the synonym of unreal, and who are all the time blaming the Science, get a new outlook by the above discussions. They also have to accept that how keen the Sicentists are to reach the truth and to what a great extent, neutral and strong is their mentality to abandon the falsehood and adopt the truth. Such a type of infinite knowledge, propounding the reality to its depth, existing in an age, when there were neither physical instruments nor physical laboratories, certainly creates faith towards itself in the rational man of today.

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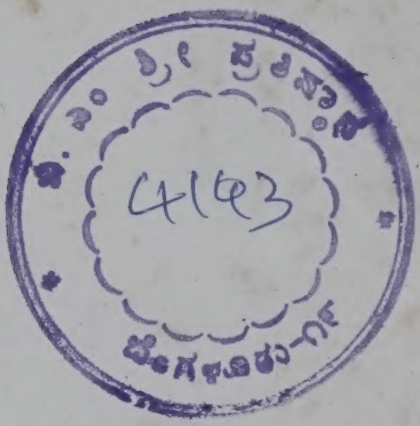
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